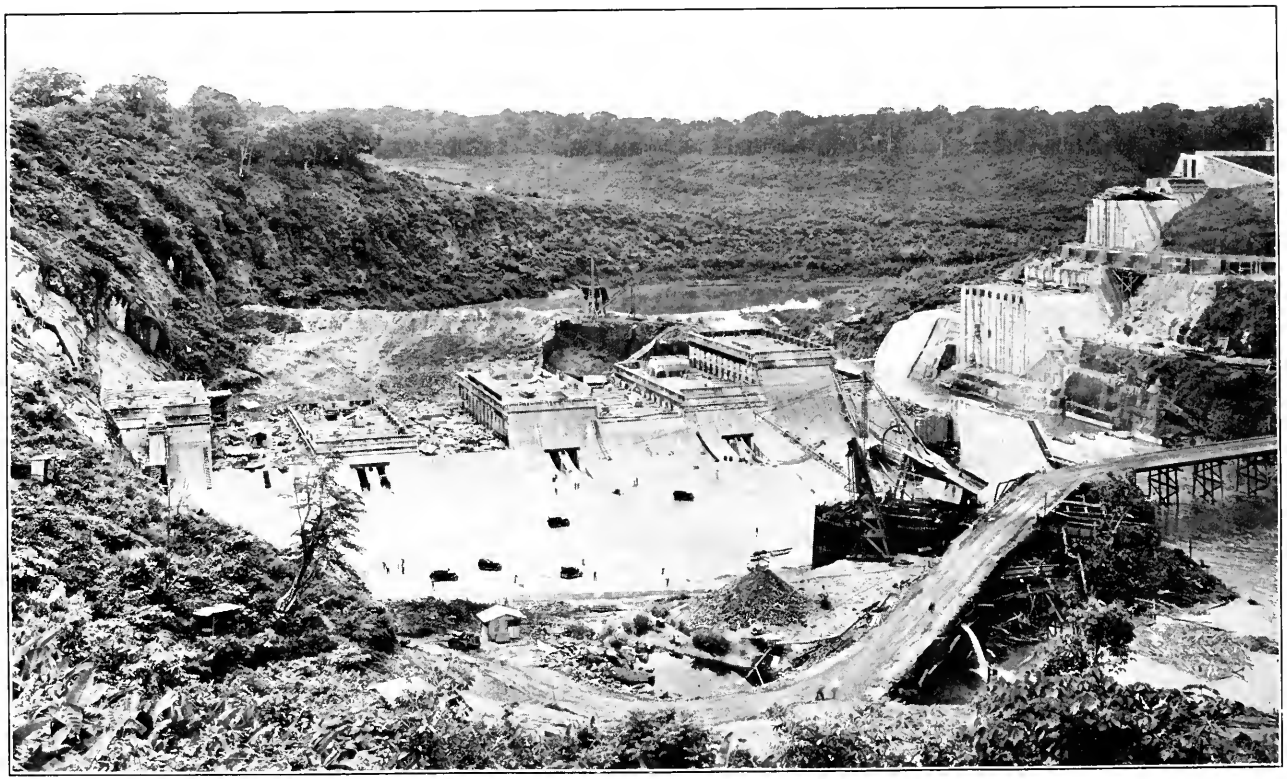
ANNUAL REPORT OF THE GOVERNOR OF THE PANAMA CANAL, 1933



MADDEN DAM ON CHAGRES RIVER AT ALHAJUELA. JUNE 30, 1933; LOOKING UP-STREAM.

Base of main dam, with spillway apron, in center; river flowing through temporary diversion channel at site of hydroelectric station. At right is south abutment of dam and its junction with Left Ridge Dam shown at extreme right of view.

ANNUAL REPORT

OF THE

GOVERNOR OF THE PANAMA CANAL

FOR THE

FISCAL YEAR
ENDED JUNE 30

1933

UNITED STATES
GOVERNMENT PRINTING OFFICE
WASHINGTON : 1933

For sale by the Superintendent of Documents, Washington, D.C. - - - - - - - - - Price 15 cents

TABLE OF CONTENTS

	Page
Summary	1
Operation and maintenance of the Canal	2
Business operations	2
Administration—Government	2
Services rendered by the canal to shipping	3
Revenues and expenses	3

SECTION I—CANAL OPERATION AND TRADE VIA PANAMA

Traffic in 1933	4
Traffic by months	6
Proportion of tanker traffic	7
Number and daily average transits of tankers and general carriers	7
Proportions of tanker tonnage and general net tonnage	8
Proportions of tolls from tank ships and from all other vessels	8
Tanker cargoes	8
Nationality of vessels	8
Tons of cargo carried	9
Commercial traffic through the Panama Canal, by nationality of vessels	9
Net tonnage of vessels	10
Number of transits in net tonnage groups	11
Frequency of transits of vessels	11
Vessels entitled to free transit and launches of less than 20 tons net measurement	13
Trade routes and cargo	13
Cargo shipments through the Panama Canal during the past 4 fiscal years, segregated by principal trade routes	14
Principal commodities	15
Commodity movement:	
Atlantic to Pacific	15
Pacific to Atlantic	16
Classification of vessels	16
Laden and ballast traffic	17
Average tonnage, tolls, and tons of cargo per cargo-carrying vessel	19
Summary of passenger movement at the Canal during 1933	19
Dual measurement system	21
Hours of operation	25
Operating hours for complete transit	25
Limits for starting on partial transits	25
Lockages and lock maintenance	26
Emergency dam operation	28
Pacific Locks overhaul	28
Power for Canal operation	29

Page

Water supply 30
Dry season 31
Madden Dam project 32
Force employed 32
Excavation 33
Grouting foundations 34
River control during construction 34
Concrete work 35
Aggregate plants 36
Electrical and mechanical work 36
Saddle dams, borrow pits, quarries, and roads 37
Quarries 38
Roads 38
Clay blanket 39
Ridge tightening 39
Clearing in reservoir 39
Materials and supplies 41
Earnings, deductions, and payments 41
Maintenance of channel and improvement projects 41
Canal improvement work 43
Project no. 1 43
Project no. 3 43
Project no. 4 43
Project no. 5 (revised) 43
Project no. 6 44
Project no. 9 44
Auxiliary dredging 44
Slides 44
Land reclamation, west of Pacific entrance 46
Subsidiary dredging activities 46
Equipment 47
Aids to navigation 47
Accidents to shipping 48
Salvage operations 49
Meteorology, hydrology, seismology 49
Precipitation 49
Air temperatures 49
Winds and humidity 49
Tides 50
Seismology 50
Rules and regulations 50

SECTION II—BUSINESS OPERATIONS

Panama Canal business operations 51
Mechanical and marine work 52
Drydock and marine work 53
Commercial shipping 53
Naval vessels 53
Army vessels 54
Other work 54
Financial 55
Electrical installation and repair work 56
Purchases and inspections in the United States 57

Panama Canal business operations—Continued. Page
Ship chandlery and other storehouse supplies 59
Fuel oil, diesel oil, gasoline, and kerosene 59
Fuel and diesel oil 59
Gasoline and kerosene 60
Storage facilities 60
Obsolete and unserviceable property and equipment 60
Building construction and maintenance 60
Quarters for employees 61
Gold employees 61
Silver employees 61
Motor and animal transportation 61
Panama Canal Press 62
Revenues from rental of lands in the Canal Zone 62
Experimental gardens 62
Business operations under the Panama Railroad 63
Receiving and forwarding agency 63
Harbor terminals 63
Canal Zone for orders 64
Commissary division 64
Sales 64
Purchases 65
Manufacturing plants 65
Hotels and restaurants 66
Cattle industry 66
Beef cattle 66
Dairy farm 66
Panama Railroad Co. lands and leases 66
Telephones and telegraph 67
Coal 67
Panama Railroad 67
Panama Railroad Steamship Line 68

SECTION III—ADMINISTRATION

Departments 69
Changes in organization and personnel 69
Force employed 70
Gold employees 71
Recruiting and turnover of force 72
Silver employees 74
Wage adjustments 75
Gold employees 75
Silver employees 76
Superannuated alien employees 78
Public amusements and recreation 78
Administrative problems 80
Legislation proposed 80
Pensioning alien employees 80
Repatriation of alien ex-employees 80
Tolls 80
Discussion of proposed legislation 81
Pensions for alien employees 81
Repatriation of unemployed aliens 81

Administrative problems—Continued.
Discussion of proposed legislation—Continued. Page
Tolls—dual measurement system 82
Genesis of rules 83
Result of rules 84
Reduction of revenues 85
Remedy 88
Rates proposed 88
Equity of proposed tolls 88
General program of plant improvement 90
Work in fiscal year 1933 90
Work in fiscal year 1934 90
Concrete wharf at Cristobal dry dock 91
Dock 14, Cristobal 91
Balboa High School and Junior College 91
Quarters for American employees 91
Dredging division station at Gamboa 92
Dump barge 92
Additional needs 92
Unemployment 92
Bureau of Efficiency 93

SECTION IV—GOVERNMENT

Area of the Canal Zone 94
Population 94
Public health 95
Vital statistics 95
General death rate 96
Death rates from disease alone 96
Birth rates, including stillborn 96
Death rate among children under 1 year of age 97
Principal causes of death 98
Malaria 98
Hospitals and dispensaries 100
Transfer of patients from Corozal Hospital 100
Smallpox vaccination 100
Garbage disposal, Pacific terminus 100
Quarantine and immigration service 100
Municipal engineering 102
Water supply 102
Sewer systems 103
Road construction 103
Thatcher Highway 103
Balboa and La Boca Roads 103
Bolivar Highway 104
Cristobal Drydock 104
Panama City and Colon 107
Water-purification plants and testing laboratory 107
Ferry service 107
Public order 108
Fire protection 110
District court 110
District attorney, office of 111
Marshal 111

Page
Magistrates' courts 112
Balboa 112
Cristobal 112
Pardon Board 112
Public-school system 112
Junior College 114
Postal system 114
Air mail 115
Customs 115
Shipping commissioner 116
Administration of estates 117
Licenses and taxes 117
Insurance 117
Immigration visas 118
Relations with Panama 118
Commercial aviation 118
Codification of laws of the Canal Zone 118

SECTION V—FINANCIAL AND STATISCAL STATEMENTS

Accounting system 120
Operations with Panama Railroad Co. funds 121
Panama Canal operations 121
List of tables:
General balance sheet 122
Assets (tables 1 to 13, inclusive) 122
Liabilities (tables 14 to 23, inclusive) 122
Operations for profit and loss (tables 24 to 26, inclusive) 122
Miscellaneous (table 27) 122
List of addenda not published 122
Major accounting tables with supplementary notes 123

REPORTS OF HEADS OF DEPARTMENTS AND DIVISIONS

Appendixes Not Printed

The material in the annual report of the Governor of the Panama Canal, published in this volume, is to a large extent a summary of data presented in annual reports from the heads of departments and divisions in the Canal organization; the latter, regarded as appendixes to the report of the Governor, are not printed. The annual report of the Panama Railroad Co. is published separately. The reports of the heads of departments and divisions, as listed below, may be consulted at the Washington office of the Panama Canal or the office of the Governor at Balboa Heights, Canal Zone:

Engineer of maintenance, report of:
- Dredging division, report of superintendent
- Madden Dam division, report of construction engineer

Assistant engineer of maintenance, report of:
- Electrical division, report of electrical engineer
- Municipal engineering division, report of municipal engineer
- Locks division, report of superintendent
- Office engineer, report of
- Section of surveys, report of chief
- Gatun Dam and backfills, report of supervisor

Marine division, report of marine superintendent
Mechanical division, report of superintendent
Supply department, report of chief quartermaster
Accounting department, report of auditor
Health department, report of chief health officer
Executive department:
- Division of civil affairs, report of chief
- Police and fire division, report of chief
- Division of schools, report of superintendent
- Bureau of clubs and playgrounds, report of general secretary
- Surveying officer, report of
- Magistrates' courts:
  - Magistrate, Cristobal, report of
  - Magistrate, Balboa, report of

Pardon board, report of chairman
District attorney, report of
Public defender, report of
District court, report of clerk
Marshal, report of
Land agent, the Panama Canal and Panama Railroad Co., report of
Purchasing department, report of the general purchasing officer and chief of Washington office.

ANNUAL REPORT

OF THE

GOVERNOR OF THE PANAMA CANAL

BALBOA HEIGHTS, CANAL ZONE,
September 30, 1933.

The SECRETARY OF WAR,
Washington, D.C.

SIR: I have the honor to submit the report of the Governor of the Panama Canal for the fiscal year ended June 30, 1933.

Attention is invited especially to the statements in sections I and III showing the unequal treatment of vessels and the loss of revenue to the Canal because of the dual measurement system for determining net tonnage. Ships pay widely divergent amounts per ton of their actual earning capacity because the tolls are limited by a measurement of net tonnage which is not related closely to earning capacity. The divergence grows greater year by year, and correspondingly the revenues of the Government are unwarrantably and unnecessarily depleted through our inability, under the present law, to collect tolls on an equitable and uniform basis. Our method for the collection of tolls should be revised by the adoption of the single basis of the uniform Panama Canal rules of measurement, and legislation to attain this end is earnestly recommended.

Respectfully,

J. L. SCHLEY, *Governor.*

SUMMARY

Administration of the Panama Canal involves three main elements: (*a*) The operation and maintenance of the Canal proper, which primarily involves the maintenance of the waterway, the operation of the locks and the control of traffic; (*b*) the operation of auxiliary business enterprises necessary for shipping and the Canal force, such as coal and fuel-oil plants, storehouses for foodstuffs, ships' chandlery, and other essential supplies, marine and railway repair shops, terminal facilities for the transshipment of cargo and passengers, operation of the Panama Railroad on the Isthmus and the Panama Railroad Steampship Line between New York and the Isthmus, quarters for the working force, and other adjuncts essential to the economical and

efficient operation of the Canal; and (*c*) administration of the government of the Canal Zone, populated by 8,654 civilians, 11,012 Americans in military and naval forces, and 23,186 natives and West Indians, in which administration are embraced education, sanitation, hospital service, police and fire protection, customs, quarantine, immigration services, post offices, etc.

The immediate administration of these various activities rests with the heads of nine major departments and divisions reporting to the Governor, in whom is centered responsibility and control for the entire organization.

OPERATION AND MAINTENANCE OF THE CANAL

The primary function of the Panama Canal is to provide and maintain a waterway by means of which vessels may make the transit from one ocean to the other, and to handle such traffic as presents itself for transit with a maxium of safety and a minimum of delay.

The only interruptions to Canal traffic during the year occurred on November 28 and 29, 1932, on account of floods. Prolonged rainfall brought water into Gatun Lake in excess of the volume which could be discharged through the spillway with 13 of the 14 gates open and to prevent further rise and flooding the lock machinery, the lock culverts at Gatun and Pedro Miguel were opened for a total of about 23 hours. While they were being so used traffic was suspended.

BUSINESS OPERATIONS

Secondary only to the operation of the Canal is the function of supplying various services to shipping. Commerce requires and has a right to expect at the Canal certain adjuncts essential to shipping, such as fuel-oil plants, coaling stations, drydocks, marine repair shops, terminal facilities for the transshipment of cargo, storehouses for the purchase of ships' chandlery, commissaries for the replenishment of food supplies, and similar essential services. These services, under coordinated and centralized control, are provided by the various business units of the Panama Canal and Panama Railroad Co. The coordination of such services with the transit of ships through the Canal assists materially in the efficient and economical operation of the waterway. Moreover, in providing marine repair facilities, fuel, and other supplies at reasonable cost, the operation of these business units promotes traffic through the Canal.

ADMINISTRATION—GOVERNMENT

The usual functions of government, such as schools, police and fire protection, quarantine, public health, immigration service, posts, customs, aids to navigation, steamboat inspection, hydrographic and meteorological work, water supply, sewers, construction and maintenance of streets, and similar activities which, in the United States, are

directed by various officers of the national, State, and municipal governments, are intrusted in the Canal Zone to the Governor, and are executed under his authority and responsibility. This centralization of all governmental activities under one head simplifies the problem of economical and efficient administration.

SERVICES RENDERED BY THE CANAL TO SHIPPING

The most important items of the business of the Canal and its adjuncts, covering principal services to shipping are expressed numerically in the following table, which presents a comparison of the activities during the fiscal year 1933 with the 2 years immediately preceding:

	Fiscal year 1931	Fiscal year 1932	Fiscal year 1933
Transits of Canal by ships paying tolls	5,529	4,506	4,494
Free transits of ocean vessels	568	473	445
Total transits of ocean vessels	6,097	4,979	4,939
Transits of launches, not counted in commercial traffic	113	94	105
Number of lockages during year:			
Gatun Locks	5,571	4,615	4,380
Pedro Miguel Locks	5,824	4,842	4,557
Miraflores Locks	5,783	4,826	4,505
Tolls levied on ocean vessels	$24,645,456.57	$20,707,377.05	$19,620,458.53
Tolls on launches (not included in above)	652.32	478.94	752.23
Total tolls	24,646,108.89	20,707,855.99	19,621,210.76
Cargo passing through Canal (tons)	25,082,800	19,807,998	18,177,728
Net tonnage (Panama Canal measurement) of transiting vessels	27,792,146	23,625,419	22,821,876
Cargo per net ton of ocean vessels, including those in ballast	.9025	.8384	.7965
Average tolls per ton of cargo, including tolls on vessels in ballast	$0.9826	$1.0454	$1.0794
Average tolls per Panama Canal net ton of vessel measurement, including vessels in ballast	$0.8868	$0.8765	$0.8597
Calls at Canal ports by ships not transiting Canal	983	874	854
Cargo handled and transferred at ports (tons)	1,168,268	989,531	1,026,128
Coal, sales and issues (tons)	169,504	65,463	39,327
Coal, number of commercial ships bunkered	452	277	197
Fuel oil pumped (barrels)	12,120,522	7,767,356	6,022,663
Fuel oil, number of ships served other than vessels operated by the Panama Canal	2,044	1,407	1,188
Ships repaired, other than Panama Canal equipment	770	593	501
Ships, drydocked, other than Panama Canal equipment	135	125	89
Provisions sold to commercial ships (commissary sales)	$789,365.78	$458,943.30	$294,416.69
Chandlery sold to ships (storehouse sales)	$55,309.48	$33,895.95	$26,386.27

REVENUES AND EXPENSES

The net revenues from Canal operations proper were $10,775,500.75, as compared with $11,194,800.88 last year, and were $7,449,344.11 below the amount of such revenues in the peak year, 1928. Net revenues from business operations under the Panama Canal in 1933 were $1,135,708.62. The combined net revenues accruing from the Canal and its business units totaled, accordingly, $11,911,209.37. The capital investment at the beginning of the fiscal year was $533,106,009.47 and the net revenue represented a return of 2.23 percent on the investment.

The foregoing figures do not include the operations carried on with funds of the Panama Railroad Co.; these resulted in a net profit of $784,432.28, as compared with $782,464.49 in the preceding year.

SECTION I

CANAL OPERATION AND TRADE VIA PANAMA CANAL

TRAFFIC IN 1933

Transits of commercial vessels, 4,494, were 12 less than in 1932, a decline of less than three tenths of 1 percent, and the daily average transits, due to there having been 366 days in 1932, was the same, 12.31. This compares with 15.15 in 1931, 16.95 in 1930, 17.37 in 1929 and 17.63 in the peak year of 1928. The showing in transits in 1933 was more favorable than in other features of the traffic, due to the inclusion of an increased proportion of small vessels. The net tonnage, Panama Canal measurement, of traffic was 3.4 percent less in 1933 than in the preceding year, tolls were lower by 5.2 percent and quantity of cargo by 8.2 percent.

With respect to the four features usually considered in canal traffic—transits, Canal net tonnage, tolls, and tons of cargo carried—the traffic in 1933 was the lowest since 1923 for transits, tolls and net tonnage, and the lowest since 1922 for cargo tonnage.

Four major periods are discernible in the history of traffic through the Canal to date. After the opening of the Canal on August 15, 1914, there was a slow growth through 8 years, in which the maximum of transits was 2,892, in 1921, until the beginning of the California oil traffic, which was primarily responsible for raising the transits to 3,967 in 1923 and 5,230 in 1924. Traffic continued at about the 1924 level until the business expansion brought a considerably increased volume toward the end of the decade. Transits reached a peak of 6,456 in 1928; tolls $27,127,376.91 and cargo, 30,663,006 tons, both in 1929; and net tonnage, Canal measurement, 29,980,614 tons, in 1930. From those levels there has been a downward movement which halted, at least temporarily, in the later months of the fiscal year 1933.

In the downward trend, the traffic reached its lowest point in July and August 1932. The daily average movement of cargo was 40,645 tons in July and the average transits and tolls reached low marks of 10.13 and $46,479.00 per day, respectively, in August. From that point traffic gained each month, due principally to the seasonal movement of wheat from the Pacific coast of North America, to the end of the calendar year. Beginning with January 1933 a decline began but the traffic did not come down to the levels of July and

August 1932, and toward the end of the year the tendency was toward an increase in traffic.

In the fiscal year 1933 the transits of naval and other public vessels of the United States Government, public vessels of the Colombian and Panamanian Governments, and vessels transiting solely for repairs, none of which pay tolls, numbered 445, as compared with 473 in 1932. The total of tollpaying and free transits combined, which includes all seagoing vessels of 20 tons or more, numbered 4,939, in comparison with 4,979 in 1932, making daily averages of 13.53 and 13.60, respectively.

Net tonnage of the commercial vessels passing through the Canal in 1933 aggregated 22,821,376 tons, Panama Canal measurement, a decrease of 3.4 percent in comparison with 1932. Tolls in 1933 amounted to $19,620,458.53, decreasing 5.2 percent in comparison with tolls in the preceding year.

The loss in net tonnage, in comparison with 1932, notwithstanding the fact that the daily average number of transits in the two years was identical, was due to a decrease in the average tonnage per vessel, accounted for principally by the heavy traffic of banana schooners of small tonnage plying between the west coast of Panama and the Atlantic terminus of the Canal. Vessels under 100 net tons in 1933 accounted for 5.2 percent of the traffic in comparison with 1.6 percent of the traffic in 1932.

The decrease in tolls was occasioned in part by the lessened Panama Canal net tonnage but was 5.2 percent in comparison with a decrease of 3.4 percent in canal net tonnage. The greater decrease in tolls than in net tonnage was due to the effect of limiting the tolls collectible to $1.25 times the net tonnage as measured under the rules for registry in the United States.

Cargo carried through the Canal in 1933 amounted to 18,177,728 tons and was 8.2 percent less than the cargo in 1932. The largest proportion of this decrease occurred in the Atlantic to Pacific movement, which declined 19.9 percent; in the opposite direction there was a decline of 3.6 percent. This is a reversal of the trend in 1932, the heaviest decrease in that year having been in the movement from the Pacific to the Atlantic. The combined movement in both directions over all the major trade routes, with the exception of that between Europe and Canada, showed decreases in 1933 although the movements to the Atlantic in the United States intercoastal trade and in the trade between the United States and the Far East registered gains. This phase of the traffic is discussed in detail under "trade routes and cargo."

The receipts from tolls reported by the accounting department for the fiscal year 1933 were $19,621,158.61. This figure includes tolls on launches, which are not included in "commercial traffic"

of ocean going ships, and also has been adjusted in accordance with refunds for overcharges and supplemental collections in the event of undercharges. These items account for the difference of $700.08 between the accounting figure and the figure for tolls levied on commercial traffic as reported in the following studies of traffic, which are based on tolls levied at the time of transit.

Commercial traffic figures for each fiscal year since the Canal was opened to navigation are shown in the table below:

Fiscal year ended June 30—	Number of transits	Panama Canal net tonnage	Tolls	Tons of cargo
1915 [1]	1,075	3,792,572	$4,367,550.19	4,888,454
1916 [2]	758	2,396,162	2,408,089.62	3,094,114
1917	1,803	5,798,557	5,627,463.05	7,058,563
1918	2,069	6,574,073	6,438,853.15	7,532,031
1919	2,024	6,124,990	6,172,828.59	6,916,621
1920	2,478	8,546,044	8,513,933.15	9,374,499
1921	2,892	11,415,876	11,276,889.91	11,599,214
1922	2,736	11,417,459	11,197,832.41	10,884,910
1923	3,967	18,605,786	17,508,414.85	19,567,875
1924	5,230	26,148,878	24,290,963.54	26,994,710
1925	4,673	22,855,151	21,400,523.51	23,958,836
1926	5,197	24,774,591	22,931,055.98	26,037,448
1927	5,475	26,227,815	24,228,830.11	27,748,215
1928	6,456	29,458,634	26,944,499.77	29,630,709
1929	6,413	29,837,794	27,127,376.91	30,663,006
1930	6,185	29,980,614	27,076,890.01	30,030,232
1931	5,529	27,792,146	24,645,456.57	25,082,800
1932	4,506	23,625,419	20,707,377.05	19,807,998
1933	4,494	22,821,876	19,620,458.53	18,177,728
Total	73,960	338,194,437	312,485,286.90	339,047,963

[1] Canal opened to traffic Aug. 15, 1914.
[2] Canal closed to traffic approximately 7 months of fiscal year by slides.

TRAFFIC BY MONTHS

The commercial traffic during each month of the fiscal year is summarized in the following table, in which are inserted for comparison the figures for the preceding year:

Month	Number of vessels		Panama Canal net tonnage		Tolls		Tons of cargo	
	1931–32	1932–33	1931–32	1932–33	1931–32	1932–33	1931–32	1932–33
July	406	326	2,110,701	1,676,492	$1,848,638.45	$1,468,728.36	1,866,803	1,259,981
August	390	314	1,998,194	1,658,112	1,770,202.71	1,440,848.87	1,789,234	1,349,453
September	396	353	2,070,873	1,868,391	1,820,735.75	1,598,265.98	1,754,855	1,347,144
October	390	394	2,081,600	1,988,133	1,823,650.74	1,714,779.06	1,762,670	1,582,261
November	376	388	2,001,745	2,035,796	1,762,036.19	1,756,865.84	1,577,523	1,531,509
December	387	431	2,033,158	2,080,069	1,757,869.54	1,781,940.03	1,648,904	1,621,581
January	377	415	2,022,275	2,069,218	1,770,250.68	1,762,808.56	1,593,585	1,463,503
February	358	368	1,878,177	1,832,658	1,647,797.06	1,575,708.35	1,645,393	1,434,862
March	363	399	1,864,896	1,989,044	1,645,366.81	1,718,908.41	1,643,952	1,738,227
April	370	370	1,863,692	1,839,597	1,608,634.67	1,554,250.14	1,443,731	1,527,978
May	357	372	1,956,958	1,883,249	1,717,401.26	1,617,943.65	1,676,790	1,629,982
June	336	364	1,743,150	1,901,117	1,534,793.19	1,629,411.28	1,404,558	1,691,247
Total	4,506	4,494	23,625,419	22,821,876	20,707,377.05	19,620,458.53	19,807,998	18,177,728
Average per month	375.5	374.5	1,968,785	1,901,823	1,725,614.75	1,635,038.21	1,650,667	1,514,811

Transits were lowest in August with 314, and highest in December with 431, a difference of 117, or 37 percent of the lower number. The daily average during the months ranged between 10.13 for August and 13.90 for December.

PROPORTION OF TANKER TRAFFIC

Transits of tank ships during the fiscal year 1933 totaled 636, an increase of 24, or 3.9 percent in comparison with the 1932 total of 612. Tanker transits in 1933 comprised 14.2 percent of the total commercial transits, made up 16.7 percent of the total net tonnage (Panama Canal measurement), paid 17.3 percent of the total tolls collected, and carried 20.9 percent of the cargo which passed through the Canal.

The three tables below show the composition of the traffic as divided between tank ships and all other commercial, or toll-paying vessels, indicated here as "general." The tables show the number and daily averages of the two classes, and of the total; the quantities and proportions of net tonnage; and the amounts and proportions of tolls. They begin with the fiscal year 1923, covering the period during which tanker traffic has been an important component of the traffic through the Canal:

Number and daily average transits of tankers and general carriers

Fiscal year	Commercial transits			Daily average transits		
	Tankers	General	Total	Tankers	General	Total
1923	913	3,054	3,967	2.5	8.4	10.9
1924	1,704	3,526	5,230	4.7	9.6	14.3
1925	1,079	3,594	4,673	3.0	9.8	12.8
1926	1,090	4,107	5,197	3.0	11.2	14.2
1927	1,324	4,151	5,475	3.6	11.4	15.0
1928	1,121	5,335	6,456	3.0	14.6	17.6
1929	1,083	5,330	6,413	3.0	14.6	17.6
1930	1,218	4,967	6,185	3.3	13.6	16.9
1931	944	4,585	5,529	2.6	12.6	15.2
1932	612	3,894	4,506	1.7	10.6	12.3
1933:						
July	51	275	326	1.6	8.9	10.5
August	49	265	314	1.6	8.5	10.1
September	51	302	353	1.7	10.1	11.8
October	54	340	394	1.7	11.0	12.7
November	53	335	388	1.8	11.1	12.9
December	59	372	431	1.9	12.0	13.9
January	61	354	415	2.0	11.4	13.4
February	52	316	368	1.8	11.3	13.1
March	51	348	399	1.6	11.2	12.8
April	48	322	370	1.6	10.7	12.3
May	52	320	372	1.7	10.3	12.0
June	55	309	364	1.8	10.3	12.1
Total, 1933	636	3,858	4,494	1.7	10.6	12.3

Proportions of tanker and general net tonnage

Fiscal year	Panama Canal net tonnage			Percentage of total net tonnage		
	Tankers	General	Total	Tankers	General	Total
1923	5,374,384	13,231,402	18,605,786	28.9	71.1	100.0
1924	10,212,047	15,936,831	26,148,878	39.1	60.9	100.0
1925	6,424,622	16,430,529	22,855,151	28.1	71.9	100.0
1926	6,343,240	18,431,351	24,774,591	25.5	74.5	100.0
1927	7,624,112	18,603,703	26,227,815	29.1	70.9	100.0
1928	6,213,969	23,214,665	29,458,634	21.2	78.8	100.0
1929	5,844,263	23,993,531	29,837,794	19.6	80.4	100.0
1930	6,564,138	23,416,476	29,980,614	21.9	78.1	100.0
1931	5,284,873	22,507,273	27,792,146	19.0	81.0	100.0
1932	3,570,398	20,055,021	23,625,419	15.1	84.9	100.0
1933	3,808,784	19,013,092	22,821,876	16.7	83.3	100.0

Proportions of tolls from tank ships and from all other vessels

Fiscal year	Tolls paid by shipping using Canal			Percentage of total tolls		
	Tankers	General	Total	Tankers	General	Total
1923	$4,769,324.63	$12,738,874.94	$17,508,199.57	27.2	72.8	100.0
1924	9,071,835.65	15,219,127.89	24,290,963.54	37.3	62.7	100.0
1925	5,728,302.26	15,672,221.25	21,400,523.51	26.8	73.2	100.0
1926	5,626,167.93	17,304,888.05	22,931,055.98	24.4	75.6	100.0
1927	6,658,806.90	17,570,023.21	24,228,830.11	27.5	72.5	100.0
1928	5,436,437.16	21,508,062.61	26,944,499.77	20.1	79.9	100.0
1929	5,145,632.19	21,981,744.72	27,127,376.91	18.9	81.1	100.0
1930	5,768,963.28	21,307,926.73	27,076,890.01	21.3	78.7	100.0
1931	4,682,320.14	19,963,136.43	24,645,456.57	19.0	81.0	100.0
1932	3,197,136.29	17,510,240.76	20,707,377.05	15.4	84.6	100.0
1933	3,393,311.02	16,227,147.51	19,620,458.53	17.3	82.7	100.0

TANKER CARGOES

Cargo carried through the Canal in tank ships during the fiscal year 1933 amounted to 3,808,067 tons, in comparison with 3,501,390 tons in 1932, an increase of 306,677 tons, or 8.8 percent. Segregation of the 1933 traffic by direction of transit shows that 271,399 tons of tanker cargo went through from the Atlantic to the Pacific, and 3,536,668 tons from the Pacific to the Atlantic.

Of the total mineral oil cargoes carried through the Canal during the fiscal year 1933, approximately 49 percent was gasoline, benzine, and naphtha; 23 percent crude oil; 21 percent gas and fuel oils; and the remainder, 7 percent, lubricating oils and kerosene.

NATIONALITY OF VESSELS

Twenty-one nationalities were represented in the commercial traffic passing through the Canal in 1933, compared with 22 in 1932, and 19 in 1931. Vessels of United States registry led in the number of transits, as has been the case during the preceding 14 years. From 1915 to 1918, inclusive, transits of British vessels exceeded those of

any other country. In all years of operation either British or United States vessels have led in transits.

With respect to cargo carried through the Canal, vessels of United States registry carried 43.9 percent of the total; British vessels, 22.9 percent; Norwegian vessels, 9.8 percent; Japanese, 6.4 percent; German, 4.5 percent; Danish, 2.5 percent; Swedish, 2.2 percent; Netherlands, 2.1 percent; French, 1.4 percent; and Italian vessels, 1.0 percent. The vessels of these 10 nations combined carried an aggregate 17,576,728 tons, or almost 97.0 percent of the total cargo passing through the Canal.

Cargo tonnage carried under the principal flags contributing to Canal traffic during the past 5 years is shown in the following tabulation:

Tons of cargo carried

	1929	1930	1931	1932	1933
United States	14,075,731	14,499,233	11,805,132	8,835,055	7,987,739
British	8,331,221	7,572,969	5,971,281	4,638,068	4,170,995
Norwegian	1,505,366	1,808,278	1,720,383	1,427,284	1,773,161
Japanese	980,041	1,009,735	1,104,512	1,031,704	1,159,733
German	1,482,279	1,388,022	1,261,763	1,078,738	813,231
Danish	518,452	505,914	606,100	521,481	448,863
Swedish	845,664	832,273	721,945	761,015	403,169
Netherlands	695,956	618,718	477,769	440,870	381,071
French	530,763	576,753	508,011	338,786	249,395
Italian	334,483	264,223	236,570	215,139	189,371
All remaining	1,363,050	954,114	669,334	519,858	601,000
Total	30,663,006	30,030,232	25,082,800	19,807,998	18,177,728

Segregation of the traffic through the Canal during the fiscal year 1933, by nationality, and showing transits, measurement tonnage, tolls, and tons of cargo, is presented in the following table:

Commercial traffic through the Panama Canal, by nationality of vessels

Nationality	Number of ships	Measurement tonnage				Tolls	Tons of cargo
		Panama Canal net	United States equivalent	Registered			
				Gross	Net		
Belgian	12	66,602	49,241	76,969	52,570	$51,334.36	50,951
Brazilian	2	7,312	5,594	9,938	6,124	6,992.50	2,277
British	1,039	5,660,301	4,069,952	6,764,512	4,122,375	4,814,485.52	4,170,995
Chilean	7	26,708	21,758	34,960	20,764	25,256.41	28,218
Colombian	7	1,900	1,868	2,510	1,904	1,968.60	2,163
Danish	113	530,515	353,328	592,521	365,769	423,316.66	448,863
Danzig	44	343,554	285,377	493,026	280,815	301,505.76	347,934
Finnish	1	3,329	2,964	4,850	2,872	3,693.75	6,308
French	66	381,870	241,673	441,637	252,686	305,257.65	249,395
German	325	1,010,756	665,137	1,119,518	681,413	822,609.33	813,231
Italian	52	394,889	257,241	482,813	291,007	316,525.27	189,371
Japanese	217	1,179,514	938,675	1,470,648	924,352	1,154,288.82	1,159,733
Netherlands	80	500,474	344,610	576,652	348,184	413,970.48	381,071
Norwegian	407	2,013,881	1,337,878	2,242,513	1,344,099	1,570,866.36	1,773,161
Panamanian	324	120,695	79,589	142,894	80,008	92,980.87	78,513
Peruvian	4	336	367	654	444	2,479.10	669
Russian	4	3,987	2,814	5,835	2,713	3,517.50	
Swedish	88	423,441	268,915	465,798	337,685	321,470.43	403,169
United States	1,686	10,099,102	7,401,789	12,162,582	7,378,522	8,933,850.79	7,987,739
Venezuelan	6	5,852	5,472	8,410	8,048	5,526.72	5,110
Yugoslav	10	46,858	34,688	56,092	34,754	42,561.65	78,857
Total, 1933	4,494	22,821,876	16,368,930	27,185,332	16,537,108	19,620,458.53	18,177,728
Total, 1932	4,506	23,625,419	17,207,789	28,770,941	17,386,148	20,707,377.05	19,807,998
Total, 1931	5,529	27,792,146	20,595,189	34,232,824	20,768,461	24,645,456.57	25,082,800

Foreign naval vessels, other than transports, colliers, hospital ships, and supply ships, pay tolls at the rate of $0.50 per ton displacement. Included in the preceding tabulation of transits and tolls, but not of tonnages, are the foreign naval vessels which transited the Canal during the fiscal year 1933 and paid tolls on the basis of displacement, as follows:

Nationality	Number of vessels	Displacement tonnage	Tolls
British	6	32,705	$16,352.50
French	2	9,778	4,889.00
Peruvian	3	4,111	2,055.50
Total	11	46,594	23,297.00

NET TONNAGE OF VESSELS

The total of 4,494 commercial vessels which transited the Canal in the fiscal year 1933 was comprised of 4,483 merchant vessels, yachts, etc., paying on the basis of net tonnage, and 11 naval vessels paying tolls on the basis of displacement tonnage. Fifty percent of the 4,483 commercial transits on which tolls were levied on net tonnage were by vessels of from 4,000 to 6,000 net tons, Panama Canal measurement. Vessels under 1,000 net tons equaled 11.7 percent of the transits, and 3.2 percent were by vessels over 10,000 net tons. The average tonnage of all transits was 5,091 net tons as compared with 5,254 net tons for the preceding fiscal year, a decrease of 163 tons, or 3.1 percent.

Vessels of Danzig registry (all tank ships) averaged the highest net tonnage at 7,808; with those of Italian registry second, with 7,594 net tons; and those of Netherland registry third, with 6,256 net tons. The lowest recorded average by nationality was for Colombia, with 271 net tons; the next lowest for Peruvian vessels, with 336 net tons; and the next lowest for Panamanian vessels, with 373 net tons.

The British liner *Empress of Britain*, of 27,589 net tons, Panama Canal measurement, which made her second transit of the Canal in 1933, was the largest commercial vessel to transit during the year, and to date is the largest commercial vessel to have made Canal transit.

The following tabulation shows the 4,483 commercial transits, other than naval vessels, in groups according to net tonnage, Panama Canal measurement, segregated by nationality, together with the average tonnages and the percentage which the total of each group formed to the total number of transits for the fiscal years 1933 and 1932:

Nationality	Number of transits in net tonnage groups												Panama Canal net tonnage	Average Panama Canal net tonnage	
	20 to 99, inclusive	100 to 999, inclusive	1,000 to 1,999, inclusive	2,000 to 2,999, inclusive	3,000 to 3,999, inclusive	4,000 to 4,999, inclusive	5,000 to 5,999, inclusive	6,000 to 6,999, inclusive	7,000 to 7,999, inclusive	8,000 to 8,999, inclusive	9,000 to 9,999, inclusive	10,000 and over	Total [1]		Fiscal year 1933	Fiscal year 1932
Belgian	----	2	----	----	----	----	----	6	4	----	----	----	12	66,602	5,550	5,499
Brazilian	----	----	----	----	2	----	----	----	----	----	----	----	2	7,312	3,656	----
British	8	60	8	17	33	351	249	124	74	53	25	31	1,033	5,660,301	5,479	5,641
Chilean	----	----	----	----	4	3	----	----	----	----	----	----	7	26,708	3,815	1,171
Colombian	1	6	----	----	----	----	----	----	----	----	----	----	7	1,900	271	162
Costa Rican	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	331
Danish	----	----	25	5	10	26	24	----	2	21	----	----	113	530,515	4,695	5,348
Danzig	----	----	----	----	----	1	----	8	2	33	----	----	44	343,554	7,808	7,403
Finnish	----	----	----	----	1	----	----	----	----	----	----	----	1	3,329	3,329	4,460
French	----	----	----	----	11	12	9	----	32	----	----	----	64	381,870	5,967	5,686
German	----	85	75	26	22	16	28	52	20	----	----	1	325	1,010,756	3,110	3,801
Greek	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	3,847
Honduran	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	2,515
Italian	----	----	----	----	----	4	----	23	----	----	25	----	52	394,889	7,594	7,156
Japanese	----	----	----	1	9	69	78	55	5	----	----	----	217	1,179,514	5,436	5,477
Netherlands	----	----	----	----	10	1	20	25	11	13	----	----	80	500,474	6,256	4,727
Norwegian	----	25	8	1	26	133	134	59	20	----	----	1	407	2,013,881	4,948	4,921
Panamanian	212	90	4	5	----	----	----	13	----	----	----	----	324	120,695	373	795
Peruvian	----	1	----	----	----	----	----	----	----	----	----	----	1	336	336	1,122
Russian	3	----	----	----	1	----	----	----	----	----	----	----	4	3,987	997	----
Swedish	----	4	----	4	6	23	44	6	1	----	----	----	88	423,441	4,812	4,728
United States	10	10	13	48	33	497	515	329	45	43	34	109	1,686	10,099,102	5,990	5,629
Venezuelan	----	2	4	----	----	----	----	----	----	----	----	----	6	5,852	975	----
Yugoslav	----	----	----	----	----	7	3	----	----	----	----	----	10	46,858	4,686	4,827
Total	234	285	137	107	168	1,143	1,104	700	216	163	84	142	4,483	22,821,876	5,091	5,254
Percent of total:																
1933	5.3	6.4	3.0	2.4	3.7	25.5	24.6	15.6	4.8	3.6	1.9	3.2	100.0	----	----	----
1932	1.6	5.0	2.5	4.6	4.3	28.9	25.2	14.4	5.5	3.1	1.8	3.1	100.0	----	----	----

[1] 11 naval vessels (6 British, 2 French, and 3 Peruvian), paying tolls on displacement tonnage, are not included.

FREQUENCY OF TRANSITS OF VESSELS THROUGH THE PANAMA CANAL

During the fiscal year 1933, 1,177 individual commercial vessels representing 21 nationalities, passed through the Panama Canal in the total of 4,494 transits. The number of transits by individual ships varied from 1 to 88, and averaged 3.82. The 88 transits were made by the small Panamanian motor schooner *Real* of 22 net tons, Panama Canal measurement. This vessel was engaged in carrying bananas from the Pacific coast of the Republic of Panama to Cristobal. The number of vessels making only one transit during the year was 297.

Although vessels of United States registry led in the aggregate number of transits during the year, Great Britain, which ranked second in transits, led in the number of individual vessels, with 420. There were 319 individual vessels of United States registry which passed through during the year.

The following table shows the number of individual ships, the frequency of transits per vessel, the total transits for the year, and

the average number of transits per individual vessel, segregated by nationality:

Nationality	Vessels making indicated number of transits per vessel during fisca year 1933															
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Belgian		1		1		1										
Brazilian		1														
British	151	146	36	39	16	24	5									
Chilean	3	2														
Colombian	1					1										
Danish	11	12	6	6	3		3									
Danzig	1	4		4	1									1		
Finnish	1															
French	2	2	6	1		4	2									
German	4	9	6	9	1	6	8									
Italian		1	2	2	1	1		2	1							
Japanese	23	21	7	15	3	7	2									
Netherlands	4	6	3	2	2	5	1									
Norwegian	34	31	20	13	11	6	2	4	3	1						
Panamanian		6	1	3	2	3										
Peruvian	4															
Russian	4															
Swedish	13	9		5		5	1									
United States	33	57	29	39	23	30	36	21	21	12	1	1	4	2	1	2
Venezuelan		1		1												
Yugoslav	8	1														
Total	297	310	116	140	63	93	60	27	25	13	1	1	4	3	1	2

Nationality	Vessels making indicated number of transits per vessel during fiscal year 1933												Total ships	Total transits	Average number of transits
	17	18	21	22	25	27	33	34	40	51	84	88			
Belgian													3	12	4.00
Brazilian													1	2	2.00
British			1		1	1							420	1,039	2.47
Chilean													5	7	1.40
Colombian													2	7	3.50
Danish													41	113	2.76
Danzig													11	44	4.00
Finnish													1	1	1.00
French													17	66	3.89
German							1	2		1			47	325	6.91
Italian													10	52	5.20
Japanese													78	217	2.78
Netherlands													23	80	3.48
Norwegian					1								126	407	3.23
Panamanian	1	1		1					1		1	1	21	324	1.54
Peruvian													4	4	1.00
Russian													4	4	1.00
Swedish													33	88	2.67
United States	4	3											319	1,686	5.29
Venezuelan													2	6	3.00
Yugoslav													9	10	1.11
Total	5	4	1	1	2	1	1	2	1	1	1	1	1,177	4,494	3.82

From the foregoing table, it will be noted that 297, or 25.2 percent, of the total individual vessels using the Canal during the year, made only one transit. Approximately 49 percent of the vessels made 3 transits or more, and less than 4 percent made 10 or more transits.

The following tabulation shows for the fiscal year 1933 the number of vessels making the indicated number of transits through the Panama Canal, the percent which each class formed of the total number of individual vessels (1,177), their aggregate number of transits, and their percent of the total commercial transits (4,494):

Number of transits	Number of vessels	Percent of individual vessels (1,177)	Total number of transits	Percent of total Canal transits (4,494)	Number of transits	Number of vessels	Percent of individual vessels (1,177)	Total number of transits	Percent of total Canal transits (4,494)
1	297	25.23	297	6.61	16	2	0.17	32	0.71
2	310	26.34	620	13.80	17	5	.42	85	1.89
3	116	9.87	348	7.74	18	4	.34	72	1.60
4	140	11.90	560	12.46	21	1	.08	21	.47
5	63	5.36	315	7.01	22	1	.08	22	.49
6	93	7.91	558	12.42	25	2	.17	50	1.11
7	60	5.11	420	9.35	27	1	.08	27	.60
8	27	2.30	216	4.18	33	1	.08	33	.73
9	25	2.13	225	5.01	34	2	.17	68	1.51
10	13	1.11	130	2.89	40	1	.08	40	.89
11	1	.08	11	.24	51	1	.08	51	1.13
12	1	.08	12	.27	84	1	.08	84	1.87
13	4	.34	52	1.16	88	1	.08	88	1.96
14	3	.25	42	.94					
15	1	.08	15	.33	Total	1,177	100.00	4,494	100.00

VESSELS ENTITLED TO FREE TRANSIT AND LAUNCHES OF LESS THAN 20 TONS NET MEASUREMENT

Naval and other vessels owned and operated in the Government service of the United States and Panama, war vessels of Colombia, and vessels transiting solely for repairs at the Balboa shops, are exempt from the payment of tolls, and such vessels are not included in the general transit statistics in this section. In 1933 there were 434 vessels in direct service of the United States Government, 3 vessels owned by the Colombian Government, and 8 vessels transiting solely for repairs, a total of 445 which transited the Canal without paying tolls. These vessels carried a total of 91,942 tons of cargo.

If charges at commercial rates had been made against these vessels, the revenue from tolls would have been increased by approximately $755,022.96, of which $747,929.58 would have been collected from the United States Government.

Launches of less than 20 tons measurement (Panama Canal net) are also excluded from the statistics of commercial traffic, although they are not exempt from the payment of tolls. The number of these transiting the Canal during the year was 105, and tolls aggregating $752.23 were collected for their passage.

TRADE ROUTES AND CARGO

The preponderant movements of cargo through the Canal were to or from the two coasts of North America, as in previous years. In the traffic from the Atlantic to the Pacific approximately 80 per cent of the cargo originated on the east coast of North America, and about 51 percent of all cargo going through to the Pacific was destined to the west coast of North America. Of the traffic in the opposite direction, 74 percent of the total came from the west coast of the continent, and about 53 percent of all cargo from the Pacific through the Canal was destined to the east coast of North America.

The following tabulation shows the aggregate movement of cargo over these nine principal routes of trade, the sum of miscellaneous routes and sailings, and the total during the past 4 years:

Cargo shipments through the Panama Canal during the past 4 fiscal years, segregated by principal trade routes

	Tons of cargo			
	1930	1931	1932	1933
United States intercoastal:				
Atlantic to Pacific	3,161,530	2,379,751	1,917,052	1,595,087
Pacific to Atlantic	7,328,534	6,425,624	4,705,932	4,831,521
Total	10,490,064	8,805,375	6,622,984	6,426,608
Europe and Canada:				
Atlantic to Pacific	139,747	124,605	69,926	70,573
Pacific to Atlantic	1,390,786	1,901,810	2,109,790	2,788,173
Total	1,530,533	2,026,415	2,179,716	2,858,746
United States and Far East (including Philippine Islands):				
Atlantic to Pacific	2,072,511	1,360,772	1,714,725	1,323,003
Pacific to Atlantic	818,184	862,053	851,124	1,077,734
Total	2,890,695	2,222,825	2,565,849	2,400,737
Europe and United States:				
Atlantic to Pacific	698,479	425,343	334,160	249,966
Pacific to Atlantic	3,319,428	2,729,347	1,834,090	1,700,808
Total	4,017,907	3,154,690	2,168,250	1,950,774
Europe and South America:				
Atlantic to Pacific	881,666	503,566	206,908	164,695
Pacific to Atlantic	1,934,744	1,804,191	1,532,204	1,368,234
Total	2,816,410	2,307,757	1,739,112	1,532,929
Europe and Australasia:				
Atlantic to Pacific	604,265	441,470	286,740	235,075
Pacific to Atlantic	594,930	671,843	422,227	295,896
Total	1,199,195	1,113,313	708,967	530,971
United States and Hawaiian Islands:				
Atlantic to Pacific	100,731	124,755	127,576	63,798
Pacific to Atlantic	96,181	135,478	395,843	349,938
Total	196,912	260,233	523,419	413,736
East coast United States and west coast South America:				
Atlantic to Pacific	378,101	252,363	116,638	44,474
Pacific to Atlantic	3,144,475	2,105,298	1,001,749	294,076
Total	3,522,576	2,357,661	1,118,387	338,550
United States and Australasia:				
Atlantic to Pacific	422,839	202,311	187,393	164,215
Pacific to Atlantic	238,803	166,648	81,501	18,552
Total	661,642	368,959	268,894	182,767
Miscellaneous routes and sailings:				
Atlantic to Pacific	1,015,856	865,493	674,240	601,003
Pacific to Atlantic	1,688,442	1,600,079	1,238,180	940,907
Total	2,704,298	2,465,572	1,912,420	1,541,910
Total traffic, all routes:				
Atlantic to Pacific	9,475,725	6,680,429	5,635,358	4,511,889
Pacific to Atlantic	20,554,507	18,402,371	14,172,640	13,665,839
Total	30,030,232	25,082,800	19,807,998	18,177,728

Of the total cargo of 18,177,728 tons passing through the Canal in the past fiscal year, 4,511,889 tons, or 24.8 per cent, were routed from the Atlantic to the Pacific, and 13,665,839 tons, or 75.2 percent, from the Pacific to the Atlantic. In comparison with the previous fiscal year, total cargo tonnage registered a decline of 1,630,270 tons, or 8.2 percent; the Atlantic to Pacific movement made a decrease of 1,123,469 tons, or 19.9 percent, while in the opposite direction the decrease was 506,801 tons, or 3.6 percent. On the nine principal trade routes listed above, but one—that between Europe and Canada—showed an increase in the combined movement in comparison with the previous year, although two—the United States intercoastal and that between the United States and the Far East—showed increases in one direction, both in the movement from the Pacific to the Atlantic.

PRINCIPAL COMMODITIES

Statistics of commodities passing through the Canal are not precise because it is not required that complete manifests of cargo carried by vessels be submitted at the Canal. In lieu of a manifest the master of each vessel is required to file a "cargo declaration", which is a briefly itemized statement, listing the principal items of cargo carried, and showing their ports or country of origin and destination. These cargo declarations are the basis of the commodity statistics. There is a natural tendency not to list small miscellaneous shipments but to include them under the head of "General cargo"; not infrequently no other classification is made of the entire cargoes carried by vessels. Hence, except in the case of commodities commonly shipped in bulk, such as mineral oils carried in tank ships, wheat, lumber, nitrates, etc., shipments of various goods are likely to be in excess of the aggregate tonnage reported during the year and shown in the annual summary. Subject to errors arising from this source the tonnage of the principal commodities shipped through the Canal during the past 4 years is shown in the following table:

Commodity movement

Commodity	Fiscal year ended June 30—			
	1930	1931	1932	1933
ATLANTIC TO PACIFIC	*Long tons*	*Long tons*	*Long tons*	*Long tons*
Manufactures of iron and steel	2,128,712	1,230,091	781,494	502,503
Cotton, raw	248,345	298,877	747,496	432,013
Mineral oils	682,742	485,520	518,498	407,492
Scrap metal	196,676	46,901	87,657	273,375
Paper	259,314	202,478	204,297	214,568
Phosphates	435,994	312,925	239,266	154,145
Sulphur	215,831	190,690	197,911	149,790
Corn	21,754	23,874	59,987	128,331
Tinplate	294,382	221,291	148,852	108,500
Canned goods (fish, fruit, vegetables, etc.)	120,373	100,311	117,857	101,751
Coal and coke	224,439	122,179	95,199	85,548
Textiles	120,750	94,254	83,756	78,555
Cement	412,347	206,483	76,870	69,105
Tobacco	118,322	116,946	65,806	67,548
Chemicals	82,417	66,690	72,436	64,072
Machinery	180,805	139,928	78,656	54,781

Commodity movement—Continued

Commodity	Fiscal year ended June 30—			
	1930	1931	1932	1933
ATLANTIC TO PACIFIC—continued	*Long tons*	*Long tons*	*Long tons*	*Long tons*
Coffee	60,103	79,382	61,241	54,491
Automobiles (exclusive of accessories)	203,089	104,002	66,673	50,731
Asphalt and tar	109,933	74,962	60,286	47,748
Glass and glassware	68,062	47,100	44,911	47,374
Sugar	101,150	87,436	58,671	40,256
Automobile accessories	84,213	51,768	39,367	35,237
Ammonium compounds	153,437	79,100	71,933	35,002
Metals, various	97,313	59,106	42,830	30,662
Salt	54,327	56,002	36,855	30,263
Railroad material	194,578	77,838	26,731	18,265
Creosote	64,844	31,662	38,482	15,315
Slag	66,945	71,627	38,547	14,225
Agricultural implements	51,517	28,289	12,956	11,567
All other	2,423,011	1,879,714	1,459,807	1,188,646
Total	9,475,725	6,680,429	5,635,358	4,511,889
PACIFIC TO ATLANTIC				
Mineral oils	5,700,587	4,824,338	3,116,844	3,506,356
Wheat	1,503,035	1,862,147	1,790,530	2,368,892
Sugar	920,399	1,033,013	1,298,830	1,667,496
Lumber	3,530,879	2,747,485	2,129,787	1,549,483
Canned goods (fish, fruit, vegetables, etc.)	806,365	876,644	787,736	865,716
Metals, various	666,057	557,498	472,560	376,396
Fruit dried	206,834	282,791	340,851	314,061
Fruit fresh	144,880	286,049	256,563	285,523
Barley	275,064	235,364	153,206	209,890
Nitrate	1,910,793	1,375,450	811,522	186,783
Flour	103,486	146,640	123,964	180,858
Food products in cold storage [1]	335,061	384,526	248,874	162,143
Coffee	102,646	149,215	125,228	152,735
Wood pulp	108,861	109,163	147,541	106,329
Beans	112,679	171,335	172,526	103,522
Paper	101,422	114,301	116,103	98,997
Wool	145,071	157,129	101,147	97,852
Ores [2]	2,229,470	1,436,792	618,368	90,518
Copra	109,172	113,587	79,471	80,789
Oats	21,123	92,812	108,089	79,898
Borax	91,921	70,913	75,463	66,205
Cotton, raw	103,408	95,622	62,005	64,931
Guano	33,210	19,070	17,505	59,688
Coconut oil	95,034	76,971	83,631	54,213
Skins and hides	64,449	66,975	53,619	52,509
Rice	89,795	116,330	53,924	34,267
All other	1,043,256	1,000,211	826,753	849,789
Total	20,554,507	18,402,371	14,172,640	13,665,839

[1] Does not include fresh fruit.

[2] Principally iron in 1930, 1931, and 1932.

CLASSIFICATION OF VESSELS

Of the 4,494 commercial vessels transiting the Canal during the fiscal year, 2,695 were steamers, 1,527 were motorships, and the remaining 272 were chiefly motor schooners. For the past 5 years the proportions of these classes have been as follows:

	1929	1930	1931	1932	1933
	Percent	*Percent*	*Percent*	*Percent*	*Percent*
Steamers	80.2	76.8	71.1	66.3	60.0
Motorships	19.3	22.8	28.4	32.1	34.0
Miscellaneous	.5	.4	.5	1.6	6.0
Total	100.0	100.0	100.0	100.0	100.0

As will be noted in the foregoing table, the proportion of motorships in the traffic through the Canal has been increasing from year to year. The actual numbers of transits of motorships in the past 5 years have been as follows: 1929, 1,240; 1930, 1,411; 1931, 1,571; 1932, 1,444; and 1933, 1,527. The heavy relative increase in the proportion of miscellaneous craft in 1933 was due to the heavy traffic of banana schooners plying between the west coast of the Republic of Panama and Cristobal.

Of the 2,695 steamers transiting the Canal during the past fiscal year, 1,902 burned oil, 732 burned coal, and 61 were reported as fitted for either fuel. For the past 5 years the proportions of each class have been as follows:

	1929	1930	1931	1932	1933
	Percent	*Percent*	*Percent*	*Percent*	*Percent*
Oil burning	64.0	72.2	72.8	76.1	70.6
Coal burning	34.7	26.4	25.6	22.1	27.2
Either oil or coal	1.3	1.4	1.6	1.8	2.2
Total	100.0	100.0	100.0	100.0	100.0

LADEN AND BALLAST TRAFFIC

A classification of the commercial (tolls-paying) traffic during the fiscal year 1933 by laden ships, those in ballast, and tolls-paying vessels which are not of the cargo type, is as follows:

	Atlantic to Pacific			Pacific to Atlantic		
	Number of ships	Panama Canal net tonnage	Tolls	Number of ships	Panama Canal net tonnage	Tolls
Cargo-carrying ships:						
Tank ships:						
Ballast	279	1,727,715	$1,243,954.80	10	34,876	$25,110.72
Laden	43	204,014	213,498.95	304	1,842,179	1,910,746.55
All others:						
Ballast	433	1,702,900	1,218,347.18	15	20,504	14,644.15
Laden	1,568	8,472,861	7,303,656.10	1,786	8,803,422	7,656,814.95
Noncargo-carrying ships:						
Yachts	24	4,410	3,257.79	14	3,796	2,761.80
Naval	5		12,330.00	6		10,967.00
Tugs	3	174	63.75			
Cable ships	2	4,268	3,781.35	1	346	249.12
All other				1	381	274.32
Total	2,357	12,116,372	9,998,889.92	2,137	10,705,504	9,621,568.61

Further details of the commercial traffic during the fiscal year 1933 by laden ships and those in ballast, divided between tankers and general cargo vessels, and showing the ships not designed to carry cargo, are as follows:

Classification	Atlantic to Pacific	Pacific to Atlantic	Total
Tank ships, laden:			
Number of transits	43	304	347
Panama Canal net tonnage	204 014	1, 842, 179	2, 046, 193
Tolls	$213, 498. 95	$1, 910, 746. 55	$2, 124, 245. 50
Cargo, tons	271, 399	3, 536, 668	3, 808, 067
Tank ships, ballast:			
Number of transits	279	10	289
Panama Canal net tonnage	1, 727, 715	34, 876	1, 762, 591
Tolls	$1, 213, 954. 80	$25, 110. 72	$1, 269, 065. 52
General cargo ships, laden:			
Number of transits	1, 568	1, 786	3, 354
Panama Canal net tonnage	8, 472, 861	8, 803, 422	17, 276, 283
Tolls	$7, 303, 656. 10	$7, 656, 814. 95	$14, 960, 471. 05
Cargo, tons	4, 240, 490	10, 129, 171	14, 369, 661
General cargo ships, ballast:			
Number of transits	433	15	448
Panama Canal net tonnage	1, 702, 900	20, 504	1, 723 404
Tolls	$1, 218, 347. 18	$14, 644. 15	$1, 232, 991. 33
Noncargo-carrying ships:			
Yachts:			
Number of transits	24	14	38
Panama Canal net tonnage	4, 440	3, 796	8, 236
Tolls	$3, 257. 79	$2, 761. 80	$6, 019. 59
Naval vessels:			
Number of transits	5	6	11
Displacement tonnage	24, 660	21, 934	46, 594
Tolls	$12, 330. 00	$10, 967. 00	$23, 297. 00
Tugs:			
Number of transits	3	----------	3
Panama Canal net tonnage	174	----------	174
Tolls	$63. 75	----------	$63. 75
Cable ships:			
Number of transits	2	1	3
Panama Canal net tonnage	4, 268	346	4, 614
Tolls	$3, 781. 35	$249. 12	$4, 030. 47
Exploration ships:			
Number of ships	----------	1	1
Panama Canal net tonnage	----------	381	381
Tolls	----------	$274. 32	$274. 32
SUMMARY			
Total cargo ships, laden:			
Number of transits	1, 611	2, 090	3, 701
Panama Canal net tonnage	8, 676, 875	10, 645, 601	19, 322, 476
Tolls	$7, 517, 155. 05	$9, 567, 561. 50	$17, 084, 716. 55
Cargo, tons	4, 511, 889	13, 665, 839	18, 177, 728
Total cargo ships, ballast:			
Number of transits	712	25	737
Panama Canal net tonnage	3, 430, 615	55, 380	3, 485, 995
Tolls	$2, 462, 301. 98	$39, 754. 87	$2, 502, 056. 85
Total tank ships:			
Number of transits	322	314	636
Panama Canal net tonnage	1, 931, 729	1, 877, 055	3, 808, 784
Tolls	$1, 457, 453. 75	$1, 935, 857. 27	$3, 393, 311. 02
Cargo, tons	271, 399	3, 536, 668	3, 808, 067
Total general cargo ships:			
Number of transits	2, 001	1, 801	3, 802
Panama Canal net tonnage	10, 175, 761	8, 823, 926	18, 999, 687
Tolls	$8, 522, 003. 28	$7, 671, 459. 10	$16, 193, 462. 38
Cargo, tons	4, 240, 490	10, 129, 171	14, 369, 661
Total noncargo-carrying ships:			
Number of transits	34	22	56
Panama Canal net tonnage	8, 882	4, 523	13, 405
Displacement tonnage	24, 660	21, 934	46, 594
Tolls	$19, 432. 89	$14, 252. 24	$33, 685. 13
Grand totals:			
Number of transits	2, 357	2, 137	4, 494
Panama Canal net tonnage	12, 116, 372	10, 705, 504	22, 821, 876
Displacement tonnage	24, 660	21, 934	46, 594
Tolls	$9, 998, 889. 92	$9, 621, 568. 61	$19, 620, 458. 53
Cargo, tons	4, 511, 889	13, 665, 839	18, 177, 728

AVERAGE TONNAGE, TOLLS, AND TONS OF CARGO PER CARGO-CARRYING VESSELS

The average measurement tonnage, tolls, and tons of cargo per cargo-carrying vessels transiting the Canal during the past 3 years are shown in the following tabulation:

	Fiscal year 1931	Fiscal year 1932	Fiscal year 1933
Measured tonnage:			
Panama Canal net	5,079	5,298	5,139
United States net tonnage	3,763	3,858	3,686
Registered gross tonnage	6,254	6,449	6,121
Registered net tonnage	3,798	3,898	3,724
Tolls	$4,491.85	$4,638.97	$4,413.43
Tons of cargo (including vessels in ballast)	4,586	4,445	4,096
Tons of cargo (laden vessels only)	5,407	5,154	4,912

NOTE.—Computations of above averages based on cargo-carrying vessels only; craft not engaged in commerce, such as yachts, naval vessels, etc., are not considered.

As noted above, the average size of vessels transiting in the past year made a decrease in comparison with the previous fiscal year. As pointed out previously in this report, this was due to the heavy traffic of banana schooners of small tonnage plying between the west coast of Panama and Cristobal. The decrease in the average net tonnage, Panama Canal measurement, in comparison with 1932 was 3 percent, while the loss in the average net tonnage, United States measurement, was 4.5 percent.

The average cargo per vessel transiting (including in the total the vessels which made the transit in ballast) decreased in the fiscal year 1933 to the extent of 7.9 percent in comparison with the preceding year, and 10.7 percent in comparison with 1931. Considering the laden vessels only, the average cargo per vessel decreased in 1933 by 4.7 percent of the average in 1932, and by 9.2 percent of the average in 1931.

SUMMARY OF PASSENGER MOVEMENT AT THE CANAL DURING 1933

During the fiscal year 1933 the number of passengers disembarking at Canal Zone ports in termination of voyage aggregated 26,012, and the number embarking, or beginning a voyage during the same period, totaled 28,314. Approximately 54 percent of the arrivals and 51 percent of the departures were carried as first-class, and the remainder as second, tourist, third, or steerage. The figures do not include passengers merely calling at the Canal, that is, arriving and departing on the same ships.

The following tabulation shows by months the number of passengers disembarking and embarking at Canal Zone ports during

the fiscal year 1933, segregated as between first-class and "others", with comparative totals for the fiscal years 1932 and 1931:

Month	Disembarking			Embarking		
	First-class	Others	Total	First-class	Others	Total
July	1,444	773	2,217	1,862	1,000	2,862
August	1,352	790	2,142	1,338	1,204	2,542
September	1,519	1,093	2,612	1,265	901	2,166
October	1,177	881	2,058	866	1,169	2,035
November	1,311	1,340	2,651	919	1,004	1,923
December	1,192	1,795	2,987	962	1,650	2,612
January	925	642	1,567	861	840	1,701
February	1,073	622	1,695	1,025	950	1,975
March	957	1,092	2,049	1,154	1,331	2,485
April	1,021	1,412	2,433	1,372	1,440	2,812
May	884	714	1,598	1,329	1,049	2,378
June	1,298	705	2,003	1,492	1,331	2,823
Total, 1933	14,153	11,859	26,012	14,445	13,869	28,314
Total, 1932	17,776	14,703	32,479	16,803	13,689	30,492
Total, 1931	21,043	18,324	39,367	19,580	18,032	37,612

As compared with 1932, the fiscal year 1933 shows a 19.9 percent decrease in the number of arrivals, and in comparison with 1931 a 33.9 percent decrease; in the number of departures there was a decrease of 7.1 percent under 1932 and 24.7 percent under 1931.

For many years the greater part of handling both cargo and passengers for the Isthmus has been through the port of Cristobal, at the Atlantic terminus of the Canal and Panama Railroad. The following table shows the passenger traffic through Cristobal and through Balboa in the past 3 years, and it is seen that about 70 percent of it has been through Cristobal:

	Port of Cristobal			Port of Balboa		
	1931	1932	1933	1931	1932	1933
Passengers disembarking	28,312	22,658	17,583	11,055	9,821	8,429
Passengers embarking	26,658	22,147	19,444	10,954	8,345	8,870

A further segregation of the passenger movement shows that 19,651 incoming and 20,973 outgoing passengers were brought from or were destined to ports on the Atlantic, and 6,361 incoming and 7,341 outgoing passengers were brought from or were destined to ports on the Pacific.

In addition to the figures shown above of passengers disembarking and embarking, there were 95,628 transient passengers brought to the Isthmus by vessels calling at Canal ports during the fiscal year 1933. For the fiscal year 1932, this number was 91,844, and in the fiscal year 1931, 100,226. The number in 1933 increased 3,784, or 4.1 percent, in comparison with those in 1932, but showed a decrease

of 4,598, or 4.6 percent, under 1931. Most of these passengers came ashore for a short period but as they departed on the vessel on which they arrived they are not included in the tabulation of passengers ending or beginning a voyage at the Isthmus. The origin and destination of these transient passengers are indicated in the following tabulation:

	Total		Fiscal year 1933		
	1931	1932	Cristobal	Balboa	Total
Remaining on board vessels transiting Canal:					
Atlantic to Pacific	42,466	35,924	38,963	----------	38,963
Pacific to Atlantic	33,644	31,392	----------	29,873	29,873
Remaining on board vessels entering port but not transiting Canal:					
Atlantic to Atlantic ports	22,408	23,528	25,510	----------	25,510
Pacific to Pacific ports	1,708	1,000	----------	1,282	1,282
Total	100,226	91,844	64,473	31,155	95,628

NOTE.—In passengers "remaining on board vessels transiting Canal", those from the Atlantic to the Pacific are taken up at Cristobal, and those from the Pacific to the Atlantic at Balboa, i.e., at the port of arrival from sea, and not again at the other terminus of the Canal.

DUAL MEASUREMENT SYSTEM

Under the existing law, tolls on commercial vessels using the Canal are levied on the basis of $1.20 per net ton, on tonnage as determined under the Panama Canal rules of measurement, for laden ships, and $0.72 per net ton, measured under the Canal rules, for ships in ballast, with the limitation that the amount collectible shall not exceed $1.25 per net ton nor be less than $0.75 per net ton as determined under the rules of measurement for registry in the United States.

The Panama Canal rules of measurement determine the net tonnage as the interior spaces of actual earning capacity, in tons of 100 cubic feet. The United States rules for measurement for registry exempt from inclusion in the net tonnage many spaces which have actual earning capacity. The result of this is, generally, that tolls on laden vessels transiting the Canal are usually paid on the basis of $1.25 times the United States net tonnage, and tolls on ballast vessels at $0.72 times the Panama Canal net tonnage. In a few cases the product of $1.20 times the Canal net is slightly less than $1.25 times the United States net, and tolls are paid on the Canal basis; there are other and more frequent cases of ships in ballast in which the Panama Canal net tonnage times $0.72 is in excess of $1.25 times the United States net, in which case the latter figure is the amount collectible. Such vessels pay less than $0.72 per net ton, Canal measurement, for transit either in ballast or laden. On small vessels such as tugs, the United States measurement sometimes indicates negative net tonnage, and such vessels make the transit without payment of tolls.

Registry rules were not designed as a suitable basis for the collection of Canal tolls and their application to the Panama Canal tolls has resulted in misunderstandings, inequalities, injustices, and depriving the Government of proper revenue. The Canal administration has recommended the use of the Canal rules only and, in order that approximately the same general level of tolls may be charged as under the present system, has recommended that if the Canal rules alone be used the rates should be set at approximately $1 per net ton for laden vessels and 40 percent less, or 60 cents, for vessels in ballast.

When this suggestion was first made it would have meant a slight decrease in the tolls collected. In later years, however, due to the reduction of the net tonnage of vessels as measured under the United States registry rules, adoption of the proposed Canal rules and rates would have meant an increase in the total tolls. Some vessels would pay more, some less than at present, in proportion to the undercharges or overcharges under the present dual system. The opposition of operators of vessels which would pay more has prevented the passage of corrective legislation. The need for such legislation is discussed in more detail in section III, under Administrative Problems.

In the discussions of the proposed adoption of the Panama Canal basis there have been statements to the effect that the change would impose undue burdens on United States vessels. The following is a comparison of the increases in the tolls which would have been paid by the United States vessels and by all vessels other than those of United States registry in the past 7 fiscal years:

UNITED STATES VESSELS ONLY

Fiscal year	Tolls actually collected	Tolls which would have been collected on proposed basis	Increase	
			Actual	Percent
1927	$12,720,447.95	$12,601,622.60	[1] $118,825.35	[1] 0.93
1928	12,645,880.20	12,662,378.60	16,498.40	.13
1929	12,299,584.70	12,471,487.00	171,902.30	1.40
1930	13,220,662.70	13,537,324.60	316,661.90	2.40
1931	11,425,999.31	11,883,318.60	457,319.29	4.00
1932	9,749,018.51	10,411,572.20	662,553.69	6.80
1933	8,933,850.79	9,670,737.20	736,886.41	8.25

ALL VESSELS OTHER THAN UNITED STATES

1927	$11,508,382.16	$11,720,617.30	$212,235.14	1.84
1928	14,298,619.57	14,583,094.40	284,474.83	1.99
1929	14,827,792.21	15,518,947.60	691,155.39	4.66
1930	13,856,227.31	14,795,367.00	939,139.69	6.78
1931	13,219,457.26	14,264,637.30	1,045,180.04	7.91
1932	10,958,358.54	12,036,778.60	1,078,420.06	9.84
1933	10,686,607.74	11,776,211.80	1,089,604.06	10.20

[1] Decrease.

The tolls paid by the vessels of various nationalities using the Canal during the fiscal year 1933 are shown in the following table, in comparison with the tolls which they would have paid on the proposed basis of $1 per Canal net ton for laden ships and 60 cents for vessels in ballast. In this table the traffic has been segregated to show general cargo and cargo/passenger vessels, and the total of all commercial traffic; the latter includes in addition to the general cargo and cargo/passenger vessels, oil tankers, and miscellaneous noncargo-carrying vessels such as yachts, foreign naval vessels, etc. There is also shown the average per Panama Canal net ton of the tolls which were actually collected on laden and ballast traffic for the various nationalities.

It will be noted from the table that the average tolls on laden vessels, adding all kinds of traffic together, ranged between 76.9 cents (on Swedish vessels) and $1.261 (on Peruvian vessels), a difference of 49.2 cents. For vessels in ballast there was an instance of Russian whaling tugs, in which the tolls averaged 36.6 cents per Canal net ton, but for the rest of the traffic the ballast charges ranged between 71 and 73.7 cents.

Among the vessels of the six nationalities represented in greatest volume in the traffic during the year (United States, British, Norwegian, Japanese, German, and Danish) the lowest average per Canal net ton on total laden vessels was 80.8 cents, on Norwegian ships, and the highest was 99.2 cents on Japanese vessels, a difference of 18.4 cents.

On the assumption that the Panama Canal rules for the determination of net tonnage are an accurate basis for the just levy of Canal dues, it is obvious that the present use of the United States rules is resulting in inequities and injustices, since the ships are not paying at equal rates on net tonnage as determined under the Canal rules of measurement, i.e., on their earning capacity. The table follows.

Nationality	Tolls actually collected under present dual system		Tolls that would have been collected under proposed rates of $1 laden and $0.60 ballast on basis of Panama Canal net tonnage		Difference				Pro rata per Panama Canal net ton on tolls actually collected					
					Increase		Decrease		Laden		Ballast		Total	
	General cargo and cargo/passenger	Total traffic	General cargo and cargo/passenger	Total traffic	General cargo and cargo/passenger	Total traffic	General cargo and cargo/passenger	Total traffic	General cargo and cargo/passenger	Total traffic	General cargo and cargo/passenger	Total traffic	General cargo and cargo/passenger	Total traffic
Belgian	$53,849.08	$54,334.36	$52,742.40	$53,146.80			$1,106.68	$1,187.56	$0.914	$0.914	$0.720	$0.720	$0.817	$0.817
Brazilian	6,992.50	6,992.50	7,312.00	7,312.00	$319.50	$319.50			.956				.956	.956
British	4,296,198.86	4,814,485.52	4,718,314.00	5,182,277.50	422,115.14	367,791.98			.870	.884	.718	.718	.841	.848
Chilean	25,256.41	25,256.41	24,096.80	24,096.80			1,159.61	1,159.61	1.019	1.019	.720	.720	.946	.946
Colombian	1,968.60	1,968.60	1,631.20	1,631.20			337.40	337.40	1.200	1.200	.737	.737	1.036	1.036
Danish	400,612.90	423,316.66	467,519.60	487,481.40	66,906.70	64,164.74			.814	.818	.718	.718	.797	.798
Danzig		304,505.76		278,000.80				26,504.96		1.038		.720		.886
Finnish	3,693.75	3,693.75	3,329.00	3,329.00			364.75	364.75	1.110	1.110			1.110	1.110
French	292,101.25	305,257.65	372,780.00	384,941.00	80,678.75	79,683.35			.784	.787		.720	.784	.787
German	822,609.33	822,609.33	983,290.40	983,290.40	160,681.07	160,681.07			.821	.821	.720	.720	.814	.814
Italian	305,472.49	316,525.27	378,754.20	388,832.60	73,281.71	73,307.33			.801	.805	.720	.720	.799	.802
Japanese	1,154,288.82	1,154,288.82	1,156,413.20	1,156,413.20	2,124.38	2,124.38			.992	.992	.722	.722	.979	.979
Netherlands	341,578.95	413,970.48	411,636.00	476,790.40	70,057.05	62,819.92			.824	.842	.720	.720	.821	.827
Norwegian	1,092,358.37	1,570,866.36	1,347,443.00	1,782,634.20	255,084.63	211,767.84			.750	.808	.704	.711	.740	.780
Panamanian	92,908.87	92,980.87	115,380.60	115,440.60	22,471.73	22,459.73			.775	.775	.732	.732	.770	.770
Peruvian	423.60	2,479.10	336.00	2,391.50			87.60	87.60	1.261	1.261			1.261	1.261
Russian		3,517.50		3,917.40		399.90				.906		.366		.882
Swedish	283,067.81	321,470.43	360,344.80	394,573.40	77,276.99	73,102.97			.753	.769	.705	.710	.747	.759
United States	6,977,519.14	8,933,850.79	7,863,972.20	9,670,737.20	886,453.06	736,886.41			.885	.904	.720	.720	.883	.885
Venezuelan		5,526.72		4,681.60				845.12		1.169		.720		.944
Yugoslav	42,561.65	42,561.65	45,030.00	45,030.00	2,468.35	2,468.35			.929	.929	.720	.720	.908	.908
Total	16,193,462.38	19,620,458.53	18,310,325.40	21,446,949.00	2,119,919.06	1,856,977.47	3,056.04	30,487.00	.866	.884	.715	.718	.852	.859
Total increase					2,116,863.02	1,826,490.47								

HOURS OF OPERATION

Dispatching of ships through the Canal is conducted on schedules. Vessels ready to leave for transit begin moving through the Canal from each end at 6 o'clock in the morning, and dispatches are made thereafter from each end at intervals of about half an hour. The following is a summary of the arrangements in effect at the end of the fiscal year.

OPERATING HOURS FOR COMPLETE TRANSIT

From Cristobal Harbor, first ship at 6 a.m., last at about 3:30 p.m.; from Balboa anchorage, first ship at 6 a.m., last at 2:30 p.m. This applies to vessels averaging 10 to 12 knots. In case of a vessel capable of 15 knots, departure may be made up to about 3 p.m. from Balboa and 3:45 p.m. from Cristobal.

LIMITS FOR STARTING ON PARTIAL TRANSITS

After the last "through" ships have been dispatched, and provided there would be no interference with approaching traffic, ships are started on partial transit from Cristobal Harbor up to 8:45 p.m. or from Balboa anchorage up to 5:30 p.m. Partial-transit ships tie up on reaching the summit level and continue the following morning; the first of these bound for the Pacific leaves Gatun at approximately 5 a.m., and the first of these bound for the Atlantic leaves Pedro Miguel at 6 a.m., provided the air is sufficiently free of fog or rain to allow safe navigation.

Two ships usually, sometimes three, each way, can be given the benefit of partial transit each day, and under ordinary conditions they gain from 2 to 3 hours. When traffic is heavy it is impracticable to use partial transits, as they would interfere with the regular schedule.

Tankers with inflammable cargoes are dispatched at the discretion of the captain of the port and are not permitted to proceed unless they can clear Gaillard Cut before dark. Overloaded tankers carrying gasoline cargo are usually restricted to schedules, leaving at 6, 6:30, and 7 a.m., but may be dispatched on other schedules if traffic warrants.

The volume of traffic at present is not such as to make advisable continuous operations throughout the 24 hours of the day, or even extensive night operation. Such operation would not only involve greater expense and increase the difficulties of maintenance of locks and channel but it is somewhat objectionable from the shipmaster's point of view on account of the hazards of navigation in restricted channels under conditions of darkness, made worse by rains and fogs. Fogs over the cut and lake usually fall before midnight and are dissipated by 8 o'clock in the morning.

LOCKAGES AND LOCK MAINTENANCE

Lockages and vessels handled, by months, during the past fiscal year, are shown in the following table, to which is appended for comparison a statement of the totals for the past 5 fiscal years.

Month	Gatun		Pedro Miguel		Miraflores		Total	
	Lockages	Vessels	Lockages	Vessels	Lockages	Vessels	Lockages	Vessels
1932								
July	325	388	350	413	349	413	1,024	1,214
August	320	365	336	386	339	389	995	1,140
September	352	404	367	420	370	455	1,089	1,279
October	389	469	400	486	396	489	1,185	1,444
November	390	454	405	474	409	493	1,204	1,421
December	404	504	426	539	421	552	1,251	1,595
1933								
January	382	471	401	511	392	510	1,175	1,492
February	354	438	361	425	351	429	1,066	1,292
March	386	482	402	479	396	487	1,184	1,448
April	372	485	383	511	369	496	1,124	1,492
May	357	447	367	467	359	452	1,083	1,366
June	349	427	359	425	354	421	1,062	1,273
Total	4,380	5,334	4,557	5,536	4,505	5,586	13,442	16,456
Fiscal year—								
1928	6,314	7,406	6,642	7,811	6,577	7,804	19,533	23,021
1929	6,289	7,428	6,473	7,994	6,325	7,934	19,087	23,356
1930	6,135	7,164	6,436	7,430	6,338	7,431	18,909	22,025
1931	5,571	6,477	5,824	6,667	5,783	6,651	17,178	19,795
1932	4,615	5,349	4,842	5,576	4,826	5,575	14,283	16,500

In the fiscal year 1933 the average numbers of lockages per day were as follows: Gatun, 12.00; Pedro Miguel, 12.48; Miraflores, 12.35.

The total number of lockages at all locks in the past year was 13,442, as compared with 14,283 in 1932 and 17,178 in 1931. The decrease during the past year was 841 or 5.88 percent.

The number of vessels locked per lockage in the fiscal year 1933 averaged as follows: Gatun, 1.218; Pedro Miguel, 1.214; Miraflores, 1.240. The average for the total of 13,442 lockages was 1.224 vessels.

Beginning July 1, 1932, the number of operating shifts at Gatun and Miraflores was reduced from 4 to 3 and at Pedro Miguel from 3 to 2. The hours of the operating shifts at the various locks until the start of the overhaul at the Pacific Locks in January 1933 were as follows:

	Gatun	Pedro Miguel	Miraflores
1 shift	7 a.m. to 3 p.m.	7:45 a.m. to 3:45 p.m.	6:50 a.m. to 2:50 p.m.
Do	9:30 a.m. to 5:30 p.m.		9:30 a.m. to 5:30 p.m.
Do	3 p.m. to 11 p.m.	1:10 p.m. to 9:10 p.m.	2:40 p.m. to 10:40 p.m.

Effective in January during the overhaul of Miraflores Locks the shifts were as follows:

	Gatun	Pedro Miguel	Miraflores
1 shift	7 a.m. to 3 p.m.	7 a.m. to 3 p.m.	7 a.m. to 3 p.m.
Do	do		3 p.m. to 11 p.m.
Do	3 p.m. to 11 p.m.	3 p.m. to 11 p.m.	11 p.m. to 7 a.m.

During this period a tie-up gang was also on duty at Pedro Miguel from 11 p.m. to 7 a.m. On February 22 the shifts were changed at Gatun so as to have the second shift on duty from 9:30 a.m. to 5:30 p.m., the normal hours.

At the start of the overhaul of Pedro Miguel Locks the hours of the operating shifts at Miraflores were changed back to: One shift, 7 a.m. to 3 p.m.; one shift, 9:30 a.m. to 5:30 p.m.; one shift, 3 p.m. to 11 p.m.

At completion of overhaul at Pedro Miguel the hours of the operating shifts were changed back to normal: 7:45 a.m. to 3:45 p.m. and 1:10 p.m. to 9:10 p.m. The night tie-up gang was discontinued at the start of Pedro Miguel overhaul.

All operating shifts are equipped to handle an 8-locomotive lockage.

There were 29 delays in lockages at Gatun Locks from 3 to 70 minutes due to faulty operation or failure of equipment. The most serious damage to a ship during lockages was to the steamship *California*, which hit the knuckle of the wing wall on April 18, causing damages estimated at $2,000, for which the Panama Canal was held responsible.

On November 8 the steamship *Gregalia*, northbound, when making the approach to the east chamber at Gatun Locks to tie up, struck the chain fender, which functioned properly and stopped the ship without damage to it. A few links of the chain were slightly bent. The chain was pulled out a distance of 44 links from the side wall machine and 19 links from the center wall machine.

At Pedro Miguel Locks there were 17 delays to lockages from 4 to 40 minutes due to faulty operation or failure of equipment. There were three power failures originating outside the locks.

At Miraflores Locks there were 26 delays to lockages from 2 to 50 minutes due to faulty operation or failure of equipment. There were four power failures originating outside the locks.

On account of flood conditions on Gatun Lake on November 28 and 29 the lock culverts at Gatun and Pedro Miguel were used to assist Gatun Spillway in discharging the excess water. Traffic was suspended during these operations. Miraflores Spillway was used to discharge the surplus water entering Miraflores Lake.

On October 21, 1932, excessive rainfall in the vicinity of the Pacific Locks caused a high level on Miraflores Lake, and as a result of attempting to handle the excess water over Miraflores Spillway without delaying lockages, the high lake level, combined with surges, resulted in the entrance of water into the upper miter gate rooms at Miraflores and lower guard gate rooms at Pedro Miguel. No permanent damage was done.

EMERGENCY DAM OPERATION

Monthly operations of all emergency dams were made except at the Pacific Locks during the overhaul when a few of the operations were omitted on account of traffic and overhaul work.

The east emergency dam at Pedro Miguel was tested on November 21 under full head with the drive pipes between the gates in place to determine if the lock gates could all be opened so as to use the emergency dam as an auxiliary spillway. It was proved that the gates could all be opened, a few of the drive pipes were raised as a unit and wicket gates were raised under head, allowing the water to enter the lock chamber and be spilled through the culverts. Each set of drive pipes has been assembled as a unit and can be lowered by a hoist into position and raised by the hoist with the assistance of a towing locomotive. Suitable anchorages have been designed to assist in holding the gates in the open position without surging in case the emergency dam should have to be used as a spillway. The anchorages are now being installed on all the gates in the east chamber at Pedro Miguel.

PACIFIC LOCKS OVERHAUL

The quadrennial overhaul of the Pacific Locks started in the afternoon of January 3, when unwatering the west chamber at Miraflores was begun. The work was completed on June 9, when the caisson was floated after the completion of the work at Pedro Miguel. This was 10 days later than the estimated date of completion, May 29. The elapsed time was 110 days at Miraflores, 47 at Pedro Miguel, a total of 157 days. Two full shifts, from 7 a.m. to 3 p.m., and from 3 to 11 p.m., were engaged in the general overhaul and at Miraflores a third shift, from 11 p.m. to 7 a.m., was engaged in miter gate work. The extra force totaled 134 gold employees and approximately 600 silver men, who were secured by transfer or by local employment for temporary service.

One of the principal features of the overhaul, and one of the factors determining the interval between overhauls, was the painting and enameling of the lock miter gates and other under water metal which must be protected from corrosion and rust. Another factor governing the interval between overhauls is the limit of wear of the roller trains on the rising stem valves which is reached in approximately four years.

Other principal features of the overhaul, as in previous overhauls, were the reconditioning and adjustment of rising stem valves and guard valves, cylindrical valves, regulating valves, nonoperating valves, auxiliary culvert valves, center wall culvert bulkheads, float wells, and miter gates. The principal feature of the entire overhaul was at Miraflores Locks where the main operating miter gates to the upper lock, main gates between upper and lower lock, and lower

main operating gates were jacked up and rolled out and replaced after renewal of hollow quoin, quoin and miter-bearing plates, and renewal of upper yoke pin and bushings and pintles and bushings. The upper pintle castings on some of the leaves showed indications of movement and large bolts were installed. On all of these gates the wood sills were replaced with concrete and new lower gate fenders and seals were installed.

Tunnels were driven through the concrete separating the lower guard gate sumps and the side wall culverts, and from the center culvert to the west guard gate sumps at both Miraflores and Pedro Miguel, and flanges were placed over the openings. This will permit unwatering with the caisson without the use of the long suction pipes to the first side wall lateral culverts, and will also permit the use of any of the pumps after the locks are unwatered.

At all of the locks routine maintenance and repairs were performed on machines and equipment. No major incidents or accidents due to faulty equipment or faulty operation by the locks personnel occurred during the year.

POWER FOR CANAL OPERATION

The power system was operated throughout the entire year with an average combined generator output of 6,183,083 kilowatt-hours per month, as compared with an average combined generator output of 5,477,583 kilowatt-hours per month for the preceding fiscal year. An average of 5,702,812 kilowatt-hours per month was distributed from substations during the fiscal year as compared with a corresponding average of 5,060,929 kilowatt-hours per month for the preceding fiscal year. Transmission and transformation loss was 7.78 percent for the year as compared with a loss of 7.50 percent for the previous year.

The Gatun hydroelectric station operated throughout the year, carrying the full load of the power system except at times of peak load when the Miraflores diesel-electric station came in on the line, and during parts of March and April, when some of the generating equipment at Gatun was out of service for general overhaul, at which time the Miraflores diesel-electric station assumed a considerable portion of the load on the system, and during parts of April and May, when some reduction in operation of Gatun hydroelectric station was necessary for the conservation of water in Gatun Lake. No interruptions to the service occurred at the Gatun station during the year.

The Miraflores diesel-electric station was maintained on a stand-by and peak-load service during the year except for the times in March, April, and May, when, as noted above, it was required to assume part of the load normally carried by the Gatun generating station.

Overhaul of the 21 main power transformers, in all power plants and substations, begun in the preceding year, was completed. Seven transformers were overhauled during the past year.

Interruptions to the transmission-line service during the year totaled 13, from the following causes: Lightning, 3; equipment failures, 2; animals, 2; blasting wire on lines, 1; undetermined, 5.

Supervisory control equipment was received in the early part of the year; was completely installed and put into operation during September 1932. This installation provides remote control of Summit and Balboa substations from the Miraflores substation, and remote control of Cristobal substation from Gatun hydroelectric station, thereby eliminating operating personnel at the Balboa and Cristobal substations and correcting difficulties at Summit substation which resulted from not having any operating personnel at that substation. By means of this remote control system the dispatchers at the controlling stations are able to perform all necessary switching operations at the controlled substations, and the control equipment indicates immediately by alarm and visually the occurrence of any abnormal condition on the transmission lines or in the respective controlled substation and also indicates exactly what part of the system equipment is in trouble.

Work was started and is advancing favorably on several projects which will eliminate from the power system the present Gatun substation. Miscellaneous equipment was reclaimed from this station for use in the new substation at Gatun and for the outdoor substation and switching station at the Gatun hydroelectric station.

WATER SUPPLY

The inflow of water into Gatun Lake from all sources and the utilization and losses of the water in the lake are summarized in the following table. There are also shown the percentages which each item formed of the total yield or total consumption. The data are presented for the fiscal years 1932 and 1933, the former for comparison; each year covers 12 months ending June 30, and thus embraces the cycle of both dry and rainy seasons.

	Billion cubic feet, fiscal year		Percent of total, fiscal year	
	1932	1933	1932	1933
Run-off above Alhajuela	95.58	89.13	41.2	38.0
Yield from land area below Alhajuela	95.61	101.05	41.2	43.1
Direct rainfall on lake surface	40.84	44.29	17.6	18.9
Total yield	232.03	234.47	100.0	100.0
Evaporation from lake surface	20.80	21.55	9.0	9.2
Gatun Lake lockages	33.95	31.78	14.6	13.6
Hydroelectric power	47.96	53.22	20.7	22.7
Spillway waste	119.80	136.83	51.6	58.4
Lock culvert discharge	4.57	3.34	2.0	1.4
Municipal use, leakage, etc	1.80	2.22	.8	.9
Total uses and losses	228.88	248.94	98.7	106.2
Increase in storage	3.15		1.3	
Decrease in storage		−14.47		−6.2
Total	232.03	234.47	100.0	100.0

On the Chagres River 21 rises of 5 feet or more were recorded at Alhajuela during the calendar year 1932; 18 were classed as freshets, 3 as floods. The most important flood in the year occurred on November 27, 28, and 29, with a crest on each day. The highest of these crests occurred on November 28, when the river reached an elevation of 116.8 feet at the Alhajuela gaging station, with a flow of 112,200 cubic feet per second; this crest was 25.8 feet above the low-water level of 91 feet.

The maximum flood of record at Alhajuela, on December 26, 1909, reached 121.0 feet, with a probable discharge of about 150,000 cubic feet per second. In the greatest Chagres flood of which there is knowledge but no precise record, the river is estimated to have reached 123.64 feet at Alhajuela, with a discharge of about 161,000 cubic feet per second. In October 1923 the river reached 117.4 feet, and in November 1931 a 2-crest flood reached a maximum of 113.92 feet. The maximum momentary inflow into Gatun Lake from its entire watershed during the flood of November 1932 is estimated at approximately 350,000 cubic feet per second. The total amount of water coming into the lake, however, was less than in the floods of 1923 and 1931.

To handle the flood of November 27–30, 1932, the spillway of Gatun Lake was operated for 675 gate-hours and lock culverts were opened for 23 culvert-hours. The opening of the spillway gates was equivalent to the opening of 1 gate for 28 days. The number of gates open at one time reached a maximum of 13 on November 28, the first time that as many as 13 gates had been open simultaneously. The force of the water removed 2 sections of handrailing on the east abutment steps, several sections of railing on the west side of the discharge apron, at the lower end, and 1 side plate from a baffle pier. During this operation very little water entered the building of the hydroelectric station and with improvements made since operation it is believed that all 14 gates may be opened safely, as far as the hydroelectric station is concerned.

The spillway operations during the year totaled 3,218 gate-hours, the equivalent of 1 gate open for 134 days. Twenty-one percent of this operation was in handling the flood of November 27–29.

DRY SEASON

From a water-supply standpoint the 1933 dry season began on January 14, 1933, and ended on May 28, 1933, the total duration being 135 days. This is 4 days longer than the 1932 dry season and 4 days longer than the average dry season which begins about December 29 and ends about May 8. The net yield of the Gatun Lake watershed was 617 cubic feet per second, compared with a 20-year average of 835 cubic feet per second, or 26 percent below the average.

The total yield was 1,506 cubic feet per second, of which 67 percent was furnished by the Chagres River. The lowest elevation of Gatun Lake was 81.39 feet, on May 26. This is equal to the previous low record, 81.39 feet, on May 24, 1926.

No effort was made to save water at the Canal locks or by operation of the Miraflores Diesel plant, until near the close of the season, when the continuing dry weather made such saving advisable.

MADDEN DAM PROJECT

Construction of the Madden Dam project was continued throughout the year. The major part of the work was carried on by the general contractor for the dam and appurtenant works, the W. E. Callahan Construction Co. and Peterson, Shirley & Gunther. Accessory work was performed by contractors for clearing and for clay stock pile. All work was performed under the direction of the government's designing, supervisory and inspectional force embraced in the Madden Dam division; and some clearing was done in April by government forces, burning debris left from last year's clearing.

FORCE EMPLOYED

The average force employed is tabulated:

	Average by months			On June 30, 1933		
	Gold	Silver	Total	Gold	Silver	Total
U.S. Government	62.5	160.4	222.9	75	144	219
Contractors for dam	232.3	558.2	790.5	186	514	700
Contractors for clearing, etc.	5.0	265.5	270.5	1	162	163
Total	299.8	984.1	1,283.9	262	820	1,082

The contractor's force reached its peak for the year during April, when 994 silver and 285 gold were at work.

The original estimate of cost for the work on the dam under contract, based on studies made in Denver and the contract entered into on September 14, 1931, was $4,048,657. Due to increased quantities, principally in foundation rock excavation with its consequent increased concrete yardage and in drilling and grouting, this estimate has been revised to $4,507,000.

A board of consulting engineers for the government, consisting of Dr. Elwood Mead, Messrs. J. L. Savage, S. O. Harper, and L. M. McClellan, inspected the various features of the work from September 30 to October 7, 1932, and reported on operations to that date and also furnished recommendations for continuing.

Dr. C. P. Berkey, consulting engineering geologist, and Mr. J. L. Savage, chief designing engineer for the bureau of reclamation, visited

the work from May 14 to 19, with the specific purpose of investigating the foundation conditions on the right abutment. During their stay they investigated all of the various features of the work, and reported on their findings.

A flood of major proportions started on November 27 and lasted 3 days. It reached its maximum at the dam site at 3:30 p.m. November 28, with a velocity of flow of 12 miles per hour, a rate of 112,200 cubic feet per second, and a crest height of 121.5 feet at the dam. It overflowed the cofferdam protecting the excavation for the dam, but in anticipation of the rise the contractor had moved his equipment to higher ground and had flooded the cofferdam so that no damage was caused to the work and very little to his equipment at the dam site. The principal damage occurred to the gravel reclaiming and loading plant, where about 2,800 feet of cable were lost and railway tracks and roadway were washed out. At the dam site the levee was broken, the suspension foot bridge and various pieces of equipment and material were lost and some of the excavation was partly filled up again. Concreting operations were resumed on December 2 on a reduced scale owing to the necessity of trucking aggregates to the screening and washing plant, pending the reestablishment of the delivery by cableway.

EXCAVATION

Excavation was begun on the right abutment during July 1932 and continued during the year. Due to the character of the rock disclosed by the operations, it was found necessary to extend the excavation into the base of the cliff about 40 feet further than originally planned, involving an increase of about 10,000 cubic yards.

While the excavation for the training wall and upstream apron disclosed satisfactory rock, overhanging rock masses on the side of the cliff were so unstable that their removal was ordered. This required taking out approximately 1,500 cubic yards of common and 19,000 cubic yards of rock. This material was practically all removed by February 1, 1933. Excavation on the left abutment presented no unusual features. It consisted in completing the excavation of blocks 16, 17, 18, and 19 and the counterforted wall, which had previously been roughed out. Some of the material was placed upstream from the dam, but most of it was placed along the powerhouse road in dump no. 2. The work was completed by the end of August 1932. Excavation for the base of the dam (blocks 4 to 15, inclusive) had been started before the beginning of the fiscal year by the removal of part of the common within the levee and a small amount of rock in block 15. The removal of the common was continued through July and August with a Monighan walking dragline

excavator equipped with a 2½-yard bucket, and digging mostly under water. Early in September, the cofferdam was unwatered, after which the excavation was continued in the dry, but by the same methods. The spoil was removed in center-dump wagons on caterpillar treads hauled by tractors. Excavation after diversion of the river in January was conducted with the idea of getting block 10 ready for concrete as soon as possible and then to work from there towards the right abutment.

Test pits spaced about 50 feet apart were excavated along the up- and down-stream sections of the foundation from block 4 to block 10. Information gained from the pits caused a general lowering of the foundation usually from 5 to 10 feet, but more in some places. The pits were carried down to 12 feet below the final adopted grade and showed the rock to be sound, the seams tight and free from disintegrated material.

Excavation for the spillway apron was made along with the dam blocks 11 and 12 being finished in November and the others after the diversion of the river. The deepest excavation on the dam was in the block 12 downstream apron cut-off trench, which reached elevation 35. Excavation for the power house foundation rock was started and completed in November. Excavation for the clay blanket, upstream from the dam, was made along with the work on the dam during February and March.

GROUTING FOUNDATIONS

To seal off the flow of water through rock joints beneath the dam there were drilled and grouted a line of holes located in the cut-off trench spaced 5 feet center to center, drilled to depths from 30 to 150 feet and at angles from vertical to 45°. Pipes were set in the concrete and after the rock was covered with concrete to a depth of 8 feet for a distance of at least 50 feet from the hole, the grout made of a solution of cement and water was pumped into the hole at pressures varying from 75 to 150 pounds per square inch. The largest quantity of cement used in any hole was 266 bags. One hundred and eighty holes were drilled and grouted, amounting to 10,656 linear feet of drilling and 2,839 bags of cement injected.

RIVER CONTROL DURING CONSTRUCTION

Diversion of the river was accomplished by building blocks 11 and 12 and portions of the left training wall and spillway apron which are located on the left shore of the old river bed. To accomplish this work, a crescent-shaped levee with a steel sheet-piling core, and having its ends well up against the left abutment, was constructed around the area to be excavated. The levee was made of river gravel

cast up by a dragline excavator. The sheet piling, supplemented by wood sheathing, projected above the fill to form a dam, with the top at elevation 116 at the upstream and 111 at the downstream ends. After blocks 11 and 12 had been built to elevation 120, and the left training wall completed, the base of the power house was constructed and excavation for blocks 13, 14, and 15 nearly completed, and the upstream concrete apron was completed as far north as block 11.

Rock-filled timber cribs were then constructed upstream from the dam and into the space north of the power plant. Sheet piling was driven to form circular cells in curved lines, extending upstream from the timber crib and downstream from the completed training wall. When these cells had crossed the crescent-shaped levee, before mentioned, the ends of the levee were excavated to open a channel which passed between blocks 12 and 16 and over the power house foundations and down through the tail race. This channel being higher than the natural bed of the river did not pass the water until a closure had been made from the upstream cells across the river to the right bank. This closure was made by constructing a levee of river gravel by means of a dragline excavator, and afterward driving a sheet pile core. The downstream closure was made by sinking a rock-filled timber crib across the river and driving a steel sheet piling wall against the downstream side of the crib. Closures were made in January 1933.

CONCRETE WORK

Concrete placing in Madden Dam commenced on August 26, 1932, in block 18, when the main plant went into operation. Concreting was confined to the left bank in blocks 11, 12, 16, 17, 18, 19, and counterforted wall until January 20, 1933, when the work was discontinued while the river was diverted and excavation commenced on the right side of the river. During this period, 57,200 cubic yards of concrete were placed.

On March 20, 1933, concreting was recommenced in block 11 and blocks 10, 9, 8, 7, 6, 5, and 4 were begun by the end of June. A total of 182,400 cubic yards was placed by June 30, 1933, making the total in place for the fiscal year 239,600 cubic yards, or about 41 percent of the total to be placed. Placing concrete was mostly done with the aid of electric vibrator equipment; two vibro spades and two puddlers being used regularly.

A minimum of 1 barrel of cement to a cubic yard of concrete is used. The maximum contemplated to be used is 1.5 barrels per cubic yard. The slump of the concrete is limited to a maximum of 3 inches in the body of the dam. The concrete is cured with water for a period of 14 days. Mixing plant operations, as well as placing operations, are continuously inspected by carefully trained men.

The maximum rate of production of concrete was 1,204.6 cubic yards in 8 hours. During the year there were used 266,579 barrels of cement, 106,122 cubic yards of sand, and 188,720 cubic yards of gravel.

AGGREGATE PLANTS

Sand and gravel are reclaimed from the river bed about a mile downstream from the dam. Excavation is by the same dragline used for the dam. Material is loaded into cars and carried to a hopper, dropped through grizzly bars spaced 8 inches apart, thence by belt conveyers to the loading line where 32-cubic foot tramway buckets are loaded at the rate of about 2 per minute, or an average of 137 cubic yards of run-of-bank gravel per hour.

At the screening and washing plant the gravel and sand are separated by means of screens with 4-mesh openings for sand, ¾-inch square, 1¾-inch round, and 3-inch round openings for gravel. The screened and washed aggregates drop into bins and are drawn off as required and elevated to the mixing plant hoppers by belt conveyor.

The concrete mixing plant is equipped with weighing batchers and water measuring tanks. Three 2-cubic-yard mixers form a battery which can load a train with 8 cubic yards of concrete at about 3-minute intervals.

A railway conveys the concrete from the mixing plant to a point beneath the cableway. A car is used having two trays of 4 cubic yards capacity each, which dump into a central chute. The car is drawn by a gas-engine locomotive and is spotted over with the 8-cubic-yard cableway bucket, then both trays are dumped.

All parts of the dam are served by 25-ton electrically operated traveling cableway, having a 1,325-foot span and 410-foot traversing range. The traveling speed on cable is 1,200 feet per minute, traversing speed 66 feet per minute, and hoisting speed 300 feet per minute.

ELECTRICAL AND MECHANICAL WORK

Work on the electrical and mechanical installations associated with the Madden Dam was begun during the year and was devoted to three major features: Experimental equipment, sluice gates and sluiceway linings, and work by Panama Canal shops.

The data and tentative plans which had been collected concerning the installation of strain meters and resistance thermometers were coordinated, and simplified plans were developed in January. Materials were purchased and fabricated and by the end of the year 9 resistance thermometers and 68 elastic-wire strain meters had been embedded in the mass concrete. Installation of pipes for observation of any uplift pressure under the base of the dam was started during

October and extended with the progress of placing concrete; by the close of the year about 30 percent of them had been drilled into foundation rock and the pipes capped.

To facilitate the future checking of the performance of the spillway apron in dissipating the velocity and energy of the spillway overflow, pitot tube and piezometer piping was installed in the spillway apron, beginning in November and was extended to keep pace with the construction program. During the month of June these pitot tube inlet supports and piezometer inlet covers below elevation 90 were cleaned, painted, and suitably guarded preparatory to allowing the water to rise over the completed apron.

The first shipment of about 200 tons of sluice-gate materials was received on the Isthmus during the last week in January, and the entire delivery of slightly over 800 tons was completed in February. On April 19 the general contractor started in block no. 10 the installation of the sluice gate frames and sluiceway linings in place and on June 16 this phase of the work was completed on all 12 sluice gates and all 6 sets of sluiceway linings.

The Panama Canal electrical shops began the fabrication of 61 resistance thermometers and 6 terminal boards, with flush-mounted steel cabinets, to accommodate the thermometers and 102 elastic-wire strain meters. The mechanical shops completed the fabrication of 630 linear feet of 30-inch galvanized steel pipe for drum gate drain lines and furnished about 1,800 linear feet of 12-inch pipe for sluice gate air vent lines. Orders were placed for additional metal fabrication, which was under way at the close of the year.

SADDLE DAMS, BORROW PITS, QUARRIES, AND ROADS

Work was carried on intermittently and by small gangs on the left ridge dam between July and December 1932, completing all the preliminary work, such as hand stripping, installation of drains, and the placing of hand-tamped material in areas where power rollers could not work. In December 1932 the contractor started placing earth embankment and until the latter part of April the work was nearly continuous. At the end of the year the earthwork and rock fill were practically complete, and the concrete pavement on the upstream slope, the parapet, and the concrete roadway were yet to be put on.

Some maintenance work was done on saddle dams nos. 6, 9, 12, 13, 14, 15, 16, and 17, and the rock fill and riprap on no. 5, and the rock fill on no. 13 were completed.

Preliminary work on saddle dam no. 8 was done during October, November, and first half of December. During the last half of December and in January the concrete cut-off wall was poured to

elevation 265. The greater portions of the earth embankment and rock fill were placed during January, February, and March. The grouting under the cut-off wall was done in January and first part of February. Gravel blanket and riprap were placed in February, March, and April. Work yet to do at the end of the year consisted of completing the concrete cut-off wall to elevation 270, building the parapet wall, and placing the concrete roadway; also placing a few hundred cubic yards of gravel blanket and riprap.

Saddle dams nos. 10 and 11 were built complete during January, February, and March. The principal items of work involved were as follows, expressed in cubic yards: Stripping, 5,351; common excavation, 248; earth embankment, 22,983; rock fill, 9,293; gravel blanket (on saddle no. 11), 1,733.

Saddle dam no. 18 was not included in the original design. It was built complete during May 1933. Quantities involved were: Stripping, 250 cubic yards; earth embankment, 1,581 cubic yards; rock fill, 444 cubic yards.

Quantities in cubic yards of principal items of work on the left ridge and saddle dams performed in the fiscal years 1932 and 1933 are shown in the following tabulation:

	Work completed		
	1932	1933	Total to date
Stripping	71,034	36,309	107,343
Common excavation	29,061	5,038	34,099
Rock excavation	10,887	19,874	30,761
Earth fill	184,479	274,295	458,774
Rock fill	17,017	104,260	121,277
Gravel blanket	1,122	6,367	7,489
Riprap		15,668	15,668
Concrete	2,745	2,303	5,048

Quarries.—Quarry no. 1, located on the east side of the Madden Road and about 5 miles from the dam site, was developed and operated to furnish 15,668 cubic yards of rock for riprap on saddle dams nos. 5 and 8.

Roads.—On the road from the Madden Road to the site of the powerhouse the following quantities of contract work were performed early in the fiscal year: Rock excavation, 1,430 cubic yards; laying 24-inch culvert pipe, 54 linear feet; and laying 15-inch culvert pipe, 27 linear feet. All other work has been maintenance work on temporary roadway and for the contractor's convenience, to enable him to use this road for construction purposes.

On the road to saddle dam no. 8 during the first half of the year about 300 linear feet of 24-inch culvert was laid at station 4 plus 18, making a total of 454 linear feet; also 572 cubic yards of common excavation and 12,699 cubic yards of rock excavation were completed.

In April, about 10,000 cubic yards of earth fill were placed. The subgrade of this road is now about complete from station 3 plus 00 to saddle dam no. 8 at station 8 plus 35.

Clay blanket.—During March and April the clay blanket, 10 feet thick, upstream from Madden Dam, was placed, with the exception of a strip 30 feet wide along the upstream face of the dam. The material came from the north end of borrow pit CR-2 and was spread and rolled in 6-inch layers. In June, the portion of the blanket in the area about 30 feet wide along the upstream side of the dam was puddled into place. The total yardage placed in the clay blanket is 19,143 cubic yards.

RIDGE TIGHTENING

The work of drilling and clay grouting for the purpose of tightening ridges against leakage from the reservoir was continued throughout the year with the same equipment and organization as in 1932.

The filling of sink hole no. 5 was completed during September, a total of 462 cubic yards of clay being placed.

The work of placing clay grout in area no. 1 was continued until January 11, 1933, when it was suspended to permit the contractor to construct saddle dams 10 and 11. There were 131 holes drilled, having a total length of 22,734 linear feet and a total of 15,994 cubic yards of grout were placed. The work during the current year was 4,186 linear feet of hole drilled, and 8,111 cubic yards of grount placed. The total cost of grout work in area no. 1 to the end of the year was $101,065, showing a unit cost of $6.33 per cubic yard of clay placed.

In order to test the effectiveness of the grouting, a test pit, 4 feet square, was dug in the south end of saddle dam no. 11 to a depth of 104 feet. The pit disclosed many small seams and cavities in the limestone foundation but all of them were well filled with clay grout. It is believed that the results of the clay grouting operations will be quite satisfactory.

Drilling grout holes at area no. 2 was started April 1, 1933, and the first grout was placed on May 9, 1933. To June 30 a total of 7,194 linear feet of hole had been drilled and 1,544 cubic yards of grout had been placed.

CLEARING IN RESERVOIR

This work embraces the clearing of areas upstream from the dam which were covered with a heavy growth of jungle timber and will be flooded by the formation of the lake. The areas embrace 300 acres which were cleared prior to the past fiscal year by forces of the Government; 120 acres on which Government forces were engaged during the past year; 1,500 acres being cleared under 3 contracts; and about 500 acres in traffic lanes which are being cleared under 2

contracts. More extensive clearing was planned originally but in October 1932 the board of consulting engineers expressed the opinion that the clearing already performed or contracted for would be sufficient and the project of more extensive clearing was abandoned.

During February and March 1933, the last of the force account clearing was completed and the total cost was $16,074.60 for 120.15 acres, or $133.80 per acre. An experiment was made to determine the effect on the burning by impregnating certain trees with sodium nitrate. The trees were bored and loaded in April 1932, cut and piled in June 1932, and burned in February 1933. Eight trees ranging in diameter from 1 to 9 feet were loaded with an average of 1½ pounds of nitrate (at 31 cents per pound). None of the trees was split open. The results of the burning were 100 percent on the following trees (diameters in parentheses): Bonga (9 feet 6 inches); higaron (8 feet 10 inches); almasigo (1 foot 1 inch); espave (6 feet); jovo (3 feet 4 inches). With the palm and the quipo the results are nil, showing that these trees must be opened up and dried out prior to burning. With the other trees, the results of the experiment indicate a large saving in the cost of burning.

The 1,500-acre contract was divided into 3 parts, known as "areas nos. 3, 4, and 5." Area no. 3 was awarded to the J. A. Jones Construction Co., April 23, 1932, and was completed during April 1933. Work was discontinued from July 1932 until February 1933.

All piling was done by hand and considerable repiling was necessary. Area no. 4 was awarded to Pucci & Butler on April 29, 1932, and was completed in April 1933; piling was done by hand and with the aid of a caterpillar tractor and was successfully continued throughout the rainy season at a slower rate than during the dry season. During the rainy season the fire was started on top of the pile with highly successful results. Area no. 5 was awarded with area no. 3 but handled by a hoist rigged to a "spar tree" around which long logs were piled teepee fashion, resting on one end and the other leaning against the pile. Burning was very successful. The average force employed on areas nos. 3 and 5 was 3 gold and 120 silver men. After the decision to abandon further major clearing, the question of traffic lanes was considered in connection with transportation on the lake and access to habitable land. For transportation purposes it was decided to clear lanes of 400 feet width on the main streams, Rio Chagres and Rio Pequeni, as far as practicable, and use a 300-foot width in the narrower channels; the secondary lanes were to be 200 feet wide on the Rio Puente and 100 feet wide on all the quebradas.

To the end of the year a total of 2,472 acres had been cleared at a total cost of $275,879.45, an average of $111.60 per acre.

MATERIALS AND SUPPLIES

The specifications require that all material for use in Madden Dam be purchased by the Government, although installed by the Madden Dam contractor. Requisitions are placed with the general storekeeper and material is delivered to the contractor at Madden siding; the transfer of responsibility is effected at the siding through the medium of a checker who receives the material for the Madden Dam division, lists it, and obtains the contractor's receipt. The contractor stores and cares for the material, and his responsibility ceases when the material is installed in the job, or when it is returned to the Government in good condition.

The total cost of all material and equipment for the completion of Madden Dam is estimated at $3,463,000. The value of material contracted for and purchased from the Panama Canal storehouses to June 30, 1933, is $1,483,469. The value of material used in construction of the works to June 30, 1933, and charged to the job, was $656,205.

EARNINGS, DEDUCTIONS, AND PAYMENTS

The value of work performed by the contractor, payments made for the work, and amounts withheld pending adjustment, during the past fiscal year and from the beginning of the job to the end of the year, are summarized as follows:

	Fiscal year 1933	Total to end of year
Earnings by contractor	$2,309,728.10	$3,045,966.82
Payments to contractor	2,147,961.56	2,810,576.41
Amounts withheld	161,766.54	235,390.41

MAINTENANCE OF CHANNEL AND IMPROVEMENT PROJECTS

All dredging operations, embracing Atlantic entrance, Gatun Lake, Gaillard Cut, Miraflores Lake and Pacific entrance sections of the Canal, with auxiliary work at the Atlantic terminals, Pacific terminals, Balboa ferry slips, Chagres River gravel, and Chamé sand operations, have been directed from the dredging division headquarters at Paraiso. A field office was maintained at Balboa during the entire year and one at Cristobal from April 17, 1933, to the end of the fiscal year.

Excavation during the fiscal year is summarized in the following table:

Location	Maintenance		
	Earth	Rock	Total
CANAL PRISM DREDGING			
Atlantic entrance (maintenance)[1]	1,503,200	0	1,503,200
Gatun Lake	19,200	2,200	21,400
Gaillard Cut:			
Project no. 5	12,350	73,450	85,800
Project no. 9	34,300	177,350	211,650
Maintenance, including slides	630,000	1,175,800	1,805,800
Miraflores Lake:			
Project no. 6	234,700	46,500	281,200
Maintenance	211,800	0	211,800
Pacific entrance:			
Projects nos. 1 and 1-B	32,700	342,100	374,800
Maintenance	2,306,300	78,300	2,384,600
Total	4,984,550	1,895,700	6,880,250
AUXILIARY			
Balboa Inner Harbor (maintenance)	1,234,700	0	1,234,700
Grand total	6,219,250	1,895,700	8,114,950

[1] In addition 159,600 cubic yards were rehandled (not shown in table).

Dredging operations at the Canal are divided in three major districts: The northern district, from contour 42 feet below mean sea level in the Atlantic Ocean to Gamboa; the central district, Gaillard Cut, from Gamboa to Pedro Miguel Locks; the southern district, from Pedro Miguel Locks to contour 50 feet below mean sea level in the Pacific Ocean. Excavation in these three districts is summarized as follows:

	Canal prism			Auxiliary			Total		Total
	Earth	Rock	Total	Earth	Rock	Total	Earth	Rock	
Northern	1,522,400	2,200	1,524,600				1,522,400	2,200	1,524,600
Central	676,650	1,426,600	2,103,250				676,650	1,426,600	2,103,250
Southern	2,785,500	466,900	2,252,400	1,234,700		1,234,700	4,020,200	466,900	4,487,100
Total	4,984,550	1,895,700	6,880,250	1,234,700		1,234,700	6,219,250	1,895,700	8,114,950

At the close of the fiscal year the estimate of material yet to be removed from the Canal prism, including siltage, slide material, and that involved in project no. 1, was 4,159,150 cubic yards of earth and 1,137,100 cubic yards of rock.

In Cristobal Harbor there are 500,000 cubic yards of earth and in Balboa Harbor 200,000 cubic yards of earth and 100,600 cubic yards of rock, the latter item a part of project no. 1.

The shoaling to occur during the ensuing fiscal year, which is in addition to the foregoing, is estimated as follows, in cubic yards:

Atlantic entrance, 200,000; Gatun Lake, 50,000; Gaillard Cut, including anticipated slides, 1,500,000; Miraflores Lake, 70,000; Pacific entrance, 800,000; Cristobal Harbor, 100,000; Balboa Harbor, 500,000; total, 3,220,000. All of this is classed as earth except 900,000 cubic yards of rock in Gaillard Cut.

CANAL IMPROVEMENT WORK

Improvement project no. 1.—This project, consisting of deepening the Pacific entrance channel from Miraflores Locks to the sea buoys including the Balboa inner harbor, from −45 feet to a ruling depth of −50 feet (mean sea level datum), was begun in July 1924. Various additions known as projects 1-A and 1-B, Pacific entrance, and project no. 1-A, Balboa Harbor, were subsequently authorized as outlined in the annual report for 1931.

With respect to the Pacific entrance channel, excavation during the year amounted to 374,800 cubic yards, making the total to the end of the year 9,521,250 cubic yards and advancing the channel portion of the project to 81 percent of completion. The harbor work was not advanced during the year and remained 90 percent completed, with 2,291,850 cubic yards having been excavated. The suction dredge *Las Cruces* worked 2½ months in Balboa Harbor, excavating 1,234,700 cubic yards, but this was classed as ordinary maintenance and not as part of the improvement project.

Project no. 3.—This project consists of widening the channel at the north entrance of Gaillard Cut and extending northward, terminating at the south end of Gamboa Reach; it also provides a tie-up station opposite Gamboa, as an extension of the original plan. Work on it was begun in September 1929.

No dredging or mining was performed on this project during the year and the excavation to date remained at 786,950 cubic yards, 44 percent of completion.

Project no. 4.—This project consists of widening the channel at the Chagres crossing, on the east side, opposite the Gamboa bridge of the Panama Railroad, and was started in March 1931. No dredging or mining on it was performed during the past year and the total excavation remains at 51,300 cubic yards, 54 percent of completion.

Project no. 5 (revised).—This was begun in December 1930 and consists of widening Gaillard Cut approach to Pedro Miguel Locks and eliminating the reverse bend from Paraiso Reach to Cucaracha Reach so as to increase the field of vision between vessels approaching from opposite directions.

Wagon, tripod, and jackhammer drills were worked 8 months on this project during the year and 40,150 cubic yards of rock were broken with 36,065 pounds of dynamite. One dipper dredge, working

26 days, excavated 12,350 cubic yards of earth, 71,450 cubic yards of mined rock and 2,000 cubic yards of unmined rock, a total of 85,800 cubic yards. This brought the total excavation to the end of the year to 546,450 cubic yards and the project to 61 percent of completion.

Project no. 6.—This project consists of broadening the original 500-foot channel extending from the south end of Pedro Miguel Locks to the north end of Miraflores Locks to a width of 750 feet. The object of widening and straightening the channel at this point is to eliminate the turn in this comparatively short reach and at the same time give additional maneuvering space for vessels in transit and while standing off awaiting lockage. Work on the project was begun in April 1932.

The suction dredge *Las Cruces* worked 2 months, excavating 446,500 cubic yards of earth and 46,500 cubic yards of soft rock. The soft rock and 234,700 cubic yards of earth were excavated from the project, and 211,800 cubic yards of earth excavation were ordinary maintenance. At the end of the year the total excavation from project no. 6 was 627,700 cubic yards, of which 75,000 cubic yards are anticipated fill, and the work was 58 percent completed.

Project no. 9.—This project, begun in June 1928, consists of widening the channel fronting the West Culebra slide to minimize the danger to ships entering Gaillard Reach and to provide a basin for retaining slide material in case of a movement of the West Culebra slide area. It is thought that the creation of this basin will lessen the tendency of the material in this area to push up in the channel.

Work was carried on intermittently from October 1932 to April 1933, with the three dipper dredges, which excavated a total of 211,650 cubic yards, of which 177,350 cubic yards were rock and 34,300 earth. The total excavation to the end of the year stood at 488,850 cubic yards, which is 98 percent of completion.

AUXILIARY DREDGING

There was no auxiliary dredging except in Balboa Harbor, where 1,234,700 cubic yards of earth were dredged in maintenance of the inner harbor, as included in the table summarizing the year's excavation.

SLIDES

The majority of the slides were either quiescent through the year or showed only occasional surface movements but there was considerable activity at the Culebra slide extension (east), also the Culebra slide (east) showed slight movement and the Culebra slide (west) was in slow continuous movement throughout the year.

The Culebra slide extension (east), which first moved into the Canal in November 1931, resumed a general movement during July, August, September, and October 1932. On September 21 and 26 movements occurred that shoaled the channel to within 10 feet of the center line. Additional breaks also occurred behind the previous break line. Six distinct movements occurred in September, extending over a frontage of 700 feet. On September 29 the channel was restored to full width and depth for the first time since July 20, but on that same day material again pushed out to within 30 feet of the center line. In October dredging operations were largely confined to the excavation of a basin, extending 75 to 100 feet east of the east prism line, for the total length of the slide area, and the removal of material as it encroached upon this basin. Some additional material was precipitated into the sliding area by new breaks occurring behind the previous break line from time to time, and also material was washed into the area, by grader no. 3, in sluicing operations. Full channel width and depth were maintained from October to the end of the fiscal year. The dipper dredges *Paraiso*, *Gamboa*, and *Cascadas* worked on this slide intermittently throughout the year, removing 404,250, 258,150, and 377,850 cubic yards, respectively, or a total of 1,040,250 cubic yards for the year. The total excavation to the end of the year from this slide was 1,347,100 cubic yards.

A 24-hour watch and drag party was maintained at this slide during slide activity. Reference points were checked weekly and hydrographic surveys of channel fronting slide were made three times weekly from July 1 to September 10, daily from September 10 to October 10, and at longer intervals for the remainder of the fiscal year. Normally the dipper dredges worked on a 2-watch basis, but from August 18 to October 7, 1 of the 2 dipper dredges worked on a 3-watch basis, the second on a 2-watch basis.

The Culebra slide (east) showed only slight movement, but during the year dipper dredges removed 191,400 cubic yards of material from the base. The total excavation to the end of the year from this slide was 20,543,350 cubic yards.

The Culebra slide (west) was in slow continuous movement and points on the 450-foot west base line showed an average monthly movement of 5 feet toward the Canal between Stations 1770 and 1795 (2,500 feet) and 1.8 feet southward between Stations 1770 and 1779. During the year 2,650 cubic yards of rock were broken with dynamite and 3 dipper dredges, working intermittently, removed a total of 250,950 cubic yards of material. The total excavation from this slide to the end of the year was 10,701,300 cubic yards.

The total slide excavation during the year was 1,558,150 cubic yards, bringing the aggregate to the end of the year to 47,378,100 cubic yards.

There were many small breaks at various points in Gaillard Cut during the year but at no place was there interference with shipping on account of slides.

LAND RECLAMATION WEST OF PACIFIC ENTRANCE

Report was made last year of the construction of the Farfan Spillway and Farfan River Dam. These were in connection with providing a basin, known as the "Farfan dump area", extending from the south side of the Thatcher Highway, west of the Farfan Road, to the foot of the hill northwest of Guinea Point, and covering about 1,500 acres in the watershed of the Farfan River, into which spoil pumped by pipeline suction dredge from the Pacific entrance channel would be placed, disposing of the spoil and at the same time reclaiming dangerous swamp areas into well-drained land suitable for use. Dumping in the Farfan area was begun during the fiscal year 1932 and 1,449,700 cubic yards were placed, including material in dikes and dams. During the past year 1,205,700 cubic yards were disposed of in the area.

Another dump area, lying to the north of the Thatcher Highway and known as the "Victoria dump", was begun in the fiscal year 1931 with the construction of a spillway, and preparation was carried on through the fiscal year 1932 in the building of dikes and dams. Disposal of spoil in this area began in January 1933, and spoil placed during the year, including material on the dike, amounted to 1,865,500 cubic yards. The Victoria area extends along the west bank of the Canal from Cerro Agua Dulce, just south of Miraflores Locks, to a point about 1,250 feet northwest of the present northern limit of the inner harbor at Balboa, and lies in the watersheds of the Victoria and Velasquez Rivers. It covers about 700 acres.

In both areas it is proposed to carry the fill up to the 20-foot contour along the base of the hills to the west of the canal. At extreme width the Victoria dump will extend inland about 1½ miles, the Farfan area about 2 miles. Average width in each case will be about half of the maximum.

SUBSIDIARY DREDGING ACTIVITIES

At the Chagres River gravel plant at Gamboa there were on hand at the beginning of the year 125,662 cubic yards of gravel and sand. During the year 46,082 cubic yards were shipped, leaving 79,580 cubic yards on hand at the end of the year. No additional material was produced during the year.

The work of removing floating obstructions and water hyacinths in Gatun Lake, Gaillard Cut, and Miraflores Lake was made somewhat more difficult than ordinary by the flood on the Chagres River of November 27 and 18; it was impracticable to hold the Gamboa

Bridge boom and large quantities of debris were carried into the Canal and Gatun Lake. Most of it was subsequently cleared out. The number of hyacinth plants destroyed during the year, by pulling or spraying, was estimated at 40,645,500.

The breakwaters at the Atlantic entrance were placed in charge of the dredging division on March 6, 1933. During March a reconnaissance and preliminary inspection were made of both the east and west breakwaters, and arrangements have been made for surveys, cross sections, and necessary maintenance.

The 250-ton floating cranes *Ajax* and *Hercules* were in commission during alternate months. In addition to routine work, they performed service in lifting small tugs and barges for repairs, in placing forms for the concrete footings, concrete crib, ramps and gantry towers at the ferry slips at Balboa, and in various jobs of heavy rigging and wrecking.

The craneboat *La Valley* pumped 5,085 yards of sand into barges at Chamé Beach and delivered the barges to the unloading wharf at the Balboa coaling station, in addition to its services in towing and rigging.

EQUIPMENT

The following floating equipment was employed during the fiscal year: Three 15-yard dipper dredges, the *Cascadas*, *Gamboa*, and *Paraiso*, operated for 145 days, 247 days, and 313 days, respectively; one 20-inch pipe line suction dredge *No. 86* was held in reserve; one 24-inch pipe line suction dredge, *Las Cruces*, worked 331 days; one hydraulic grader was operated for 9 months; the drillboat *Terrier No. 2* was operated 12 months, but the drillboat *Teredo No. 2* was operated 2 days and then placed in reserve; floating air compressor *No. 29* worked 8 months and floating air compressor *No. 27* was out of commission for the entire year; the craneboat *La Valley* was in operation throughout the entire year; two 250-ton floating cranes were in commission alternately through the year; 3 large and 2 small tugboats were operated during the year, one or two of them in turn being under repairs or held in reserve; miscellaneous small craft were used throughout the year in auxiliary service.

AIDS TO NAVIGATION

The maintenance of lights, buoys, beacons, etc., in the Canal and adjacent waters was continued, and several improvements and adjustments were made. All center-line ranges in Gaillard Cut were changed in August to show fixed green lights, in order to provide a uniform lighting system and to differentiate this class of aids from other aids in the vicinity of the Cut. About 1,000 feet of armored submarine cable were laid, placing the west lighthouse circuit from Miraflores to Balboa on a 12-hour automatic basis. Four flashing

buoys were established on September 1, marking the Thatcher Ferry approach channels. Sun relays were installed on range tower no. 25, controlling the following aids in the lake area: Range tower no. 25, beacons nos. 29 and 30, and bridge lights nos. 1 to 8, inclusive. Similar installations were made at the Yacht Club channel lights and beacon no. 6 in the Pacific entrance. These changes reduce continuous burning to a 12-hour automatic service.

Extension of shed at Gatun Buoy Yard and installation of a sandblast plant for the expeditious cleaning of steel buoys were accomplished during the year. The tank house at Taboguilla Island Light was repaired and removed to a new location to obtain greater protection from sea action. Subsequently, heavy seas again caused the tank house to be carried away; temporary repairs have been made until a suitable permanent structure can be erected. During the year the small boat channels in the Siri Grande, Siricito, Lagarterito and Gigante sections of Gatun Lake have been maintained. Aids to navigation at Jicarita and Morro Puercos in the Pacific approach to the Canal were maintained for the United States Department of Commerce, the lighthouse tender *Favorite* making three visits to these lights during the year.

ACCIDENTS TO SHIPPING

The board of local inspectors conducted investigations and submitted reports on 26 accidents of a marine nature, as compared with 48 for the previous year. These accidents occurred either to vessels in transit or in the terminal areas. The number of accidents in which the estimated damages amounted to $1,000 or more was 3, as compared with 5 in the fiscal year 1932. Classification of the 26 accidents investigated shows the following: Struck lock walls or fenders, 10; collision between vessels, 6; struck wharves or piers, 2; and one each of the following: Struck ferry ramp, struck Canal bank, damaged by assisting tug, stern light fouled by locomotive wire and lost, chock damaged while in locks, and damaged by anchor fouled by locomotive wire. In two of the cases investigated, damaged was alleged but not proved.

Following is a brief summary of the more serious accidents, in chronological order:

Date	Vessel	Cause of accident	Estimated damage	Responsibility attributed to—
1932				
Oct. 29	William A. McKenney	Struck wing wall of locks	$2,000	Vessel.
1933				
Apr. 18	California	Struck wing wall of locks	2,000	Panama Canal.
May 15	Juan Sebastian Elcano	Struck *Pastores* moored at dock	550	Vessel.
15	Pastores	Struck by *Juan Sebastian Elcano*	700	Do.
June 9	Betty Maersk	Struck bank of Canal	3,000	Do.

On October 17, 1932, the motor vessel *Baru* and sloop *Leonidas*, both of Panamanian registry, collided in Canal Zone waters in the vicinity of Flamenco Island and San Jose Rock, resulting in the sinking of the *Leonidas* with loss of two lives. No Canal employees were involved. The value of the *Leonidas* was not estimated.

SALVAGE OPERATIONS

No major salvage operations were handled during the year. The lighthouse tender and tug *Favorite* was dispatched on February 11, 1933, to the assistance of the steamship *Santiago*, afire off the coast near Cape Mala, but while the *Favorite* was on the way she received orders to return and no assistance was rendered to the *Santiago*. The *Favorite* rendered assistance to a seaplane of the United States Navy disabled in Gatun Lake on July 15, 1932.

METEOROLOGY—HYDROLOGY—SEISMOLOGY

Precipitation.—For the calendar year 1932 precipitation in general was above normal for the Canal Zone and vicinity. Annual totals ranged from 62.46 at Taboga to 163.63 inches at Porto Bello. The maximum precipitation recorded in 24 consecutive hours was 9.19 inches, at Cristobal on November 23 and 24. The average precipitation in the Pacific section was 75.56 inches, in the central section 112.62 inches, and in the Atlantic section 150.05 inches.

Air temperatures.—The average air temperature was normal except over the upper Chagres region, where it was below, and the Atlantic coast, where it was above normal; March and April were the warmest months, November the coolest. The following table shows for four major stations the maximum and minimum temperatures during the calendar year 1932 and the annual mean, based on bihourly recordings, and also the corresponding figures for the years of record, in degrees Fahrenheit:

Station	Calendar year 1932			During years of record			
	Maximum	Minimum	Average	Maximum	Minimum	Average	Years
Balboa Heights	94	67	78.7	97	63	78.7	27
Alhajuela	94	61	77.5	98	59	78.6	22
Gatun	92	70	80.4	95	66	80.4	22
Cristobal	93	71	80.4	95	66	79.9	25

Winds and humidity.—The annual wind movement in the Canal Zone was below normal. February was the month of greatest average wind velocity and June the month of the lowest. The mean relative humidity of the atmosphere was about 83 percent on the Pacific coast and about 82 percent on the Atlantic. The average

day-time cloudiness was above the normal. Maximum cloudiness occurred in November, minimum in February and March. One light and six dense fogs were observed over the Pacific entrance of the Canal, frequent night and early morning fogs at interior stations during the rainy season. Practically all fogs lifted or were dissipated by 9:30 a.m.

Tides.—For the calendar year 1932 the maximum high tide at Balboa, 10.7 feet above zero on the recording rod (approximately mean sea level), occurred on October 2; the maximum low tide there, 10 feet below zero occurred on March 23 and 24. The greatest daily range there, 20.5 feet, occurred on March 24. At Cristobal the maximum high tide, 1.94 feet, occurred on November 30, during a "norther", and set a new record high tide for the port. The maximum low tide, 0.96 foot below the zero, occurred on March 28. The greatest daily range, 2.21 feet occurred on November 28.

Seismology.—Sixty-five seismic disturbances were recorded at the Balboa Heights seismological station during the calendar year 1932. Of these, 23 were of comparatively close origin, within 200 miles, and three of these, occurring on February 5, February 20, and August 24, were felt generally in the Canal Zone and vicinity. Seventeen were of distinct origin and 25 were of such slight intensity that no estimate could be made of the location of the epicenter. Of 36 seismic disturbances occurring in the first 6 months of 1933, 6 were felt by local residents and 1, on June 19, 1933, was of intensity IV on the modified Mercalli intensity scale of 1931. No material damage was done. Throughout the year efforts were made to adjust the new seismographs, installed in May 1932, for more accurate performance and further adjustments are under way. Two 25-kilogram Bosch-Omori seismographs which had been replaced by new equipment were transferred in September 1932 to the Smithsonian Institution at Montezuma Observatory, Calama, Chile, without charge.

RULES AND REGULATIONS

The rules and regulations governing the navigation of the Panama Canal and adjacent waters were issued under Executive order of September 25, 1925, and have been modified from time to time by supplements in accordance with Executive order. The current edition is that of August 1, 1931, which was amended during the past year by supplement no. 2, dated May 13, 1933, amending rule 54, relative to authorized speed of vessels in transit through the Canal. The increases in speeds allowed by the amendment have resulted in decreasing the minimum allowed time for a transit from 8 hours and 15 minutes to 7 hours and 3 minutes. This will result in saving many ship-hours to vessels transiting the Canal.

SECTION II

BUSINESS OPERATIONS

Because of the distance of the Panama Canal from places of supply and repair, the Canal organization maintains facilities for the repair and supply of ships as well as for the operation and maintenance of the Canal and the care of employees. These facilities are operated by "business divisions" of the Canal organization and units of the Panama Railroad Co. For accounting purposes the Canal and railroad organizations are separate but in administration and performance of work they are united and under the central control of the Governor of the Panama Canal.

PANAMA CANAL BUSINESS OPERATIONS

The profits, or excess of revenues over expenses, for the business activities of the Panama Canal amounted to $1,135,708.62 for the year, as compared with $557,095.44 in the fiscal year 1932. This was an increase of $578,613.18, or 103.9 percent. However, of the indicated excess of revenues over expenses in 1933 the sum of $475,585.34 is due to impoundings of percentages of salaries and wages in accordance with the Economy Acts; and the excess, not counting the impoundments, would be $660,123.28, an increase over the preceding year of $103,027.84, or 18.5 percent. The profits were made principally in the electric light and power system and the shops and drydocks. The results are presented in some detail in table 26 in section V.

In the accounting of profits and losses of the business activities there is no actual interest charge on the money invested in these plants and their equipment. This investment totaled $26,486,679.88 at the beginning of the fiscal year and $27,264,922.75 at the end (table 4 in sec. V). To establish a criterion for profit, a capital charge has been calculated, based on 3 percent of the capital investment (with minor variations, such as 2 percent on public works in Panama and Colon, and 1½ percent on the shops at Balboa, which for reasons of national defense were made somewhat more extensive than the needs of commerce require) plus relatively slight amounts representing variations in supplies on hand. This theoretical capital charge for the fiscal year 1933 (table 20 of sec. V) was $768,988.08. The profits of $1,135,708.62 exceeded this amount by $366,720.54; the profits of $660,123.28 without the inclusion of the Economy Act impoundments fell short of meeting the capital charge by the sum of $108,864.80.

Based on the figure of $26,486,679.88, representing fixed property and equipment alone at the beginning of the year, the profits counted at $1,135,708.62 showed a return of 4.29 percent; counted at $660,123.28, the profits showed a return of 2.49 percent on the capital invested.

MECHANICAL AND MARINE WORK

The volume of work performed for the Panama Canal, which is the principal item in the work of the mechanical division shops, showed a decrease of $31,553.04, or 2.2 percent, as compared with the preceding fiscal year. Work for the Panama Railroad Co. showed a decrease of $121,049.79, or 21.2 percent, as compared with the fiscal year 1932. Work for other departments of the Government showed an increase in comparison with the fiscal year 1932 of $3,089.91, or 0.4 percent. Work for individuals and companies, including that of ships transiting the Canal or calling at terminal ports, showed an increase of $18,704.61, or 6.1 percent, as compared with the preceding year. For the five fiscal years from 1925 to 1929, inclusive, the value of work for individuals and companies averaged approximately $925,000 a year. Compared with this, the amount of work in 1930 and 1931 was about two thirds normal and the amount for 1932 and 1933 about one third normal work.

The total volume of work for all interests was $2,935,737.62, a decrease of $130,808.31 or 4.27 percent from the preceding year. This compares with a decrease of $265,665.71 or 7.97 percent from 1931 to 1932.

The value and class of work done and the sources of the same for 1933, as compared with the 2 preceding years, are shown in the following table:

	1931	1932	1933
Amount of work completed:			
Marine	$1,713,789.06	$1,969,748.14	$1,780,519.25
Railroad	633,279.48	499,761.06	430,051.40
Stocks and materials	307,117.44	207,178.82	340,737.30
Sundries	678,025.66	389,857.91	384,429.67
Total	3,332,211.64	3,066,545.93	2,935,737.62
Origin of work completed:			
Individuals and companies [1]	632,378.02	303,490.55	322,195.16
The Panama Canal	1,518,041.62	1,416,841.97	1,385,288.93
Panama Railroad Co	676,367.39	569,785.37	448,735.58
Other departments of United States Government	505,424.61	776,428.04	779,517.95
Total	3,332,211.64	3,066,545.93	2,935,737.62

[1] Includes Panama Railroad Steamship Line.

The lessened volume of work has necessitated part-time employment in all departments of the mechanical division. Furlough periods varied during the year according to the work available. During the

first 6 months of the fiscal year the furlough time amounted to about 20 percent of the normal working days and during the following 6 months, in which the Pacific Locks were overhauled, it varied from 2 to 10 percent; the average for the year was approximately 12 percent. No employments of new men were made during the year, and reemployments were few; the employment ratio was the lowest the mechanical division has ever experienced.

DRY DOCK AND MARINE WORK

A total of 117 vessels was drydocked during the year—69 at Balboa and 48 at Cristobal. A classification of these vessels follows:

Classes of vessels drydocked	Balboa	Cristobal	Total
Panama Canal equipment	25	3	28
U.S. Navy vessels	24	11	35
U.S. Army vessels	1	6	7
Other United States Government vessels	1	1	2
Panama Railroad vessels	1	0	1
Commercial line vessels	17	27	44
Total	69	48	117

Commercial shipping.—At both Balboa and Cristobal the repairs to commercial vessels consisted principally of emergency and voyage repairs to vessels transiting the Canal or calling at Cristobal.

At the Balboa shops annual overhauls, including drydocking, were given the steamships *Iocoma, Maracay,* and *Cali,* and the cableship *All America.* The motorships *Cauca* and *Caldas,* brought from Colombia, were extensively reconditioned and outfitted for local freight service. Extensive repairs were performed on the steamship *Coya,* which had been ashore near La Union, Salvador, and at the same time the rudder was converted from single-plate type to streamlined type. It is reported that the *Coya* now makes half a knot more speed than before, with equal fuel consumption.

At the Cristobal shops important repairs to commercial vessels included general deck and engine repairs to the steamship *Velma Lykes,* after damage inflicted by a hurricane; repairs to broken crankshaft of main engine of the motorship *Sveajarl;* and renewal of all brick work in all boilers of the steamship *Point Lobos.*

Naval vessels.—While the amount of repair work performed on commercial vessels as compared with that for the previous fiscal year was about the same, that undertaken for the United States Navy during the fiscal year 1933 established a record to date. The total, including both Balboa and Cristobal shops, was $669,516.32, or approximately 38 percent of the total amount of marine work undertaken by the mechanical division during the year. In comparison, marine work performed for the Navy for the 2 preceding

fiscal years amounted to $647,290.59 for 1932 and $419,067.01 for 1931. The increased volume of Navy work for 1933 included extensive repairs and alterations made to submarines based on the Canal. The bulk of this work consisted of the annual overhaul of submarines nos. *S-11*, *S-12*, *S-13*, *S-14*, *S-15*, *S-16*, *S-17*, and *S-48*, of the tenders *Chewink*, *Mallard*, and *Swan*, and of subchasers nos. *223* and *353;* and incidental repairs and alterations of submarines nos. *S-10*, *S-11*, *S-12*, *S-14*, *S-15*, *S-16*, *S-17*, and *S-48*, the cruiser *Memphis*, the destroyers *Sturtevant* and *Overton*, and the tenders *Swan* and *Lapwing*. The United States frigate *Constitution* which transited the Canal on December 27, 1932, on the way to the Pacific coast of the United States, was docked at Balboa for bottom cleaning and minor repairs.

Army vessels.—Annual overhauls were accomplished for the distribution boat no. *L-53*, mine planter *Graham*, motorship *Morgan Lewis*, and tug *Lt. W. B. Caither*, as well as incidental repairs to distribution boat no. *L-55*, tug *General G. W. Getty*, launch *Q-2* and the mine planter *Graham*, and various other units of the Army floating equipment on both the Atlantic and Pacific sides of the Isthmus.

OTHER WORK

Floating equipment of the marine division was given the usual annual overhaul, the principal jobs being on the tugs *Gorgona*, *Tavernilla*, *Cocoli*, and *Favorite*. The north pontoon for the launch landing at Dock 17, Balboa, was drydocked for cleaning, painting, and repairs to the concrete hull. These pontoons, which are among the first reinforced concrete hulls ever built, are in good condition after about 18 years of use. Two new launches, *Teal* and *Hawk*, were completed and delivered to the marine division for service. For the dredging division annual overhauls and drydocking were effected on the drill boat *Teredo No. 2*, dredges *Las Cruces* and *Cascadas*, tug *Chagres*, and various dump scows and other floating equipment.

Construction of the craneboat *Atlas*, a brief description of which was given in the report for last year, proceeded throughout the year. The keel was laid on November 18, 1932, on the south side wall of the drydock at Balboa. The hull was completed there and side-launched into the dock on April 12, 1933, with a drop of 7 feet into the water. At the end of the year the vessel proper was largely completed and the large crane (75-ton capacity) and most of the auxiliary equipment were at hand for installation. Near the end of the year it was decided to add a sand pump and a towing engine to the equipment of the vessel and orders for them were placed.

During the first half of the fiscal year the shops manufactured or reconditioned a large and diverse quantity of repair parts for use in the overhaul of the Pacific locks and prepared additional sets of

equipment for removal of lock gates. An idle nut-tapping machine was rebuilt into a 3-spindle space drill to facilitate drilling the nickel steel bars forming the track for the roller trains; this machine drilled and tapped the strips about three times as fast and one half the cost as under previous practice.

Emergency and operating repairs were performed in large number for the contractors at Madden Dam, in particular on pieces of key equipment, and a variety of work was done for the Panama Canal for use at the dam.

The installation of the steel towers and ramp bridges for the two ferry landings in connection with the Thatcher Highway was completed in July and August 1932.

Work of erecting, testing, and painting the second 1,000,000-gallon water storage tank at Mount Hope was completed during the year.

The enlargement and reconstruction of the drydock at the Cristobal shops was the principal feature in the maintenance or development of plant during the year. The old drydock was closed on December 13, 1932, and the work of enlargement was begun. It was continued through the rest of the year by force of the municipal division and at the end of the year the work was about 80 percent completed. The new drydock will take vessels up to 385 feet in length by 61 feet beam, and drawing nearly 21 feet of water. The 1,000-foot drydock at Balboa will remain available for larger vessels.

In the reconstruction of the Cristobal shops the new wood shop was completed with the exception of a small lean-to section to contain the sawmill. Machinery was removed from the old power house building and installed in the new, with the exception of the 2,500-foot air compressor, which was retained for use during the rebuilding of the drydock. Upon the release of this compressor and its transfer to the new power house the old power plant and pump house will be demolished, giving space for the completion of the machine shop, which is otherwise finished and in use. Following the completion of the machine shop there will remain the installation of a small foundry to complete the program of rebuilding the Cristobal shops but the funds for this foundry are not yet available.

FINANCIAL

The total expenditures of the mechanical division amounted to $2,619,256.64, which is $141,527.25 less than in the preceding year. Net revenues of $41,300.60 were earned after making deductions for Cristobal shop improvements, gratuitous refund, and pay-roll impoundments. Local reserves at the end of the fiscal year for repairs to buildings and equipment and for replacements of machinery and

equipment, improvements to Cristobal shops, and gratuity for employees' leave totaled $650,545.59, as compared with $576,626.44 at the end of the fiscal year 1932.

ELECTRICAL INSTALLATION AND REPAIR WORK

Repairs on commercial ships included electrical work, including repairs to radio installations. Work on United States Navy vessels included the complete overhaul of electrical circuits and equipment on the submarine *S-48*, general alterations, overhaul, and installations of new equipment on the submarines *S-10*, *S-11*, *S-12*, *S-13*, *S-14*, *S-15*, *S-16*, and *S-17*, and some alterations on the minesweepers *Swan* and *Chewink;* and overhaul and repairs were performed on 6 vessels of the Army and 3 vessels belonging to the Panama Canal.

The important items of electrical work on shore during the year included installations in new quarters, the constructing quartermaster's repair shop at Balboa, and the new high school building in New Cristobal; the wiring for lighting and for installation of power for ramp hoists at the ferry landings at Balboa; alterations to the switchboard at the Miraflores pumping station; installation of electrical equipment in the restaurants at Cristobal, Ancon, and Balboa with accessory transformers, switchboards, and power feeders; installation of supervisory control equipment in the hydroelectric station at Gatun and the substations at Balboa, Summit, Miraflores, and Cristobal; relocation of street light circuits due to widening of streets, and extension of circuits to new quarters and to Army and Navy areas, and relocation of circuits in the Cristobal shops area due to the reconstruction of the shops and drydock; installation of the submarine cable extending across the Canal to the west ferry landing, followed by the removal of the overhead line from Miraflores along the west bank of the Canal; and work on the flood warning system on the upper Chagres and Pequeni Rivers.

The flood warning system involves two separate phases, one for use during the construction of Madden Dam and the other for flood control after the formation of Madden Lake. The first phase involved the extension of telephone lines from Alhajuela to Indio on the Chagres and Salamanca on the Pequeni and the employment of observers at those stations to give advice of rises on the rivers. This part was completed in the fiscal year 1930 and proved of great value in connection with the floods in November 1931 and October and November 1932. The second phase is the extension of the lines farther up the rivers, to Chico on the Chagres, to Candelaria on the Pequeni, and to Peluca on the Boqueron, a tributary to the Pequeni, and the installation at these stations of automatic transmitters, actuated by floats, which will transmit electrical impulses to recorders at Alhajuela. The line to Chico was completed in the fiscal year 1932 and the transmit-

ting and recording mechanisms were installed early in the fiscal year 1933. They were found to be unsuited to the conditions, involving transmission for a distance of about 15 miles and subjection of the apparatus to much disturbance by lightning. A different kind of equipment was secured and proved to be satisfactory. With the establishment of the automatic station at Chico the observer was removed from Indio.

For the stations at Candelaria and Peluca underground cables were laid during the past year from Salamanca to the sites of the proposed stations. This involved laying about 32,000 feet of 8-conductor cable from Salamanca to a point above the mouth of the Boqueron, about 6,300 feet of 5-conductor cable thence to Peluca, and about 10,800 feet of 5-conductor cable from the same point to Candelaria. The work was unusually difficult, due to the rough topography, jungles, weight of reels, and lack of transportation. With the filling of the lake, presumably in 1935, underwater cables will be laid from Alhajuela to Salamanca and Indio and the present overhead telephone lines connecting these points will be removed. The lines installed from Salamanca to Candelaria and Peluca, and from Alhajuela to Indio and Chico, are part of the permanent installation. Pending the filling of the lake the automatic devices at Candelaria and Peluca will not be installed and no observer will be stationed there, but an observer will be kept at Salamanca.

After the completion of the dam and lake the flood warning system is expected to make possible such control of the level of the lake as normally to avoid the necessity of discharging through the penstocks and spillway more than 50,000 cubic feet per second, which rate of discharge causes a current at Gamboa of not more than 4 miles per hour and will not interfere with navigation through the Canal.

Installation of electric ranges and water heaters in Canal quarters continued. At the end of the year the total numbers of the 3 types of electric ranges in use on the rental basis were 7 of the 6-burner official type, 1,682 of the 4-burner type, and 52 of the 2-burner type.

PURCHASES AND INSPECTIONS IN THE UNITED STATES

The principal purchases for supplies for the Panama Canal are made by the Washington office. Branch offices in charge of assistant purchasing agents were continued in operation during the past year at New York, New Orleans, and San Francisco. These offices were not called upon to make many purchases but acted as receiving and forwarding agencies for materials which have been purchased by the Washington office for forwarding to the Isthmus through their respective ports. The Panama Canal medical section, New York

general depot, United States Army, Brooklyn, N.Y., has continued as heretofore to make purchases of the principal medical and hospital supplies which are used for the Panama Canal on the Isthmus.

Wherever practicable, purchases are made for delivery on the Isthmus in accordance with the long-established policy of permitting competition for the Canal's requirements on even terms in all sections of the country.

The force of inspectors in the field, under the supervision of the inspecting engineer located at Washington, has been continued as in the past for the purpose of making preliminary inspections of materials in the United States covering purchases, whether delivery is required on the Isthmus or elsewhere. The number of orders placed during the fiscal year was 7,232, being an increase of 572 as compared to the fiscal year 1932, or 8.6 percent.

The total value of orders placed by the Washington office during the year was $3,612,438.71, as compared with $4,018,092.85 for the fiscal year 1932, or a decrease of $405,654.14. These totals do not include requisitions for medical and hospital supplies handled through the medical section, New York general depot, United States Army, Brooklyn, nor orders placed by the assistant purchasing agents at New York and New Orleans, which together amounted to $74,711.58. Including the business of the past fiscal year, the total purchases of supplies and materials covered by orders placed in the United States by and under the Washington office since the year 1904 is $221,460,510.92.

The assistant auditor's office in Washington prepares vouchers for payments to be made in the Washington office, keeps records relative to payments and financial transactions, conducts correspondence relative to payment of claims, has charge of collections, prepares reports and claims submitted to the General Accounting Office, claims division, for settlement, has charge of work in connection with the deposit for tolls made with the Federal Reserve banks, and in general passes upon legal questions involved in the transactions of the business of the Washington office. During the year 9,977 disbursement vouchers, amounting to $3,874,344.86, and 693 collection vouchers, amounting to $95,348.17, were prepared. In addition to the collection vouchers, 12 collections, amounting to $40,000, were made by transfer of appropriations through the General Accounting Office, making the total amount collected $135,348.17 on 705 different accounts, a decrease of $68,569.38 in the amount collected.

During the year 37 contracts were prepared, amounting to $1,789,-971.34, representing a decrease from the preceding year of 26 contracts and $4,449,592.88 in amount. Among the contracts let in the fiscal year 1932 was the one for the construction of Madden Dam, amounting to $4,048,657, which largely accounts for the decrease in the value of contracts prepared in 1933 in comparison with the previous year.

SHIP CHANDLERY AND OTHER STOREHOUSE SUPPLIES

Operation of the storehouses, including the main or general storehouse at Balboa and the subordinate stores at Cristobal, Paraiso, and minor branches, was continued as in previous years. The policy of keeping the value of stock on hand down to as low levels as is compatible with maintaining adequate supplies was followed and the book value of stock on hand at all storehouses at the end of the year was $4,380,393.46 (sec. V, table 11). The total value of all materials received on requisition from the United States during the year was $3,598,839.81. Local purchases were made during the year to the extent of $404,881.43.

Scrap and obsolete stock remaining on hand at the end of the year were valued at $58,174.15. Among the sales of scrap during the year was that of 166 net tons of American scrap iron, sold in the local market.

The storehouses handled a total of 140,898 requisitions and foremen's orders during the year. The value of all issues for the year was $5,258,366.85. Material and supplies sold to steamships, employees, and others aggregated $713,366.43 in 86,585 separate sales. Sales to ships amounted to $26,386.27, a decrease of $7,509.68 as compared with the previous year. Sales were made to 1,578 vessels.

Native hardwood amounting to 202,255 board feet of logs and 291 crossties was purchased from local contractors.

Cement issued during the year amounted to 332,177 barrels, of which 261,315 barrels were for Madden Dam.

For the year's operations, revenues exceeded expenditures by $89,903.40.

FUEL OIL, DIESEL OIL, GASOLINE, AND KEROSENE

Fuel and diesel oil.—All deliveries of oil to and from tanks, for the Panama Canal, the Navy, and private companies, are handled through the pipe lines and pumping plants of the Panama Canal. During the past year the total of fuel and diesel oil handled by the two Canal plants, including both receipts and issues, was 6,022,663.46 barrels, as compared with 7,767,356 barrels in the preceding year. The operations during the fiscal year 1933 are shown in the following table:

	Balboa (barrels)	Mount Hope (barrels)	Total (barrels)
Received by the Panama Canal	216,576.65	274,746.99	491,323.64
Used by Panama Canal and Panama Railroad Co	183,288.53	251,906.19	435,194.72
Pumped for individuals and companies	1,877,545.91	3,170,473.57	5,048,019.48
Sold by the Panama Canal	5,625.42	5,537.63	11,163.05
Miscellaneous transfers on tank farms	17,630.65	19,331.92	36,962.57
Total receipts, deliveries, and transfers	2,300,667.16	3,721,996.30	6,022,663.46

The number of ships discharging or receiving fuel oil (including diesel oil) during the year totaled 1,303, of which number 115 were Panama Canal craft.

Gasoline and kerosene.—Bulk gasoline and kerosene received on the Isthmus during the year totaled 3,425,464 and 968,985 gallons, respectively.

Storage facilities.—No changes in volume of storage facilities were made during the year and they remained as follows:

	Balboa	Mount Hope	Total
Fuel and diesel oil.....barrels	1,209,540	1,194,500	2,404,040
Gasoline and kerosene.....gallons	4,807,000	2,263,000	7,070,000

In the operation of the fuel oil handling plants the revenues of the Panama Canal exceeded expenses by $12,538.60 (sec. V, table 26).

OBSOLETE AND UNSERVICEABLE PROPERTY AND EQUIPMENT

During the year disposition was made of $250,520.52 worth of obsolete or unserviceable property and equipment by sale, or by destruction where the items had no money value. Replacement was made in all cases where conditions warranted.

BUILDING CONSTRUCTION AND MAINTENANCE

The principal projects of building construction completed during the year were the new high school and five 2-family quarters at Cristobal, nurses' quarters at Colon Hospital, junior high school building and one cottage at Balboa, two official houses at Ancon, combination silver mess and bachelor quarters at La Boca, waiting room at the west landing of the ferry at Balboa, bathhouse at Farfan Beach, and addition to the incinerator at Summit. The principal projects under construction at the end of the year and due to be completed in 1934 are 72-room bachelor quarters at Cristobal, 28-apartment bachelor quarters in the Fort DeLesseps area, covered passageway at Colon Hospital, pump and compressor building at Cristobal shops, five 2-family houses at Ancon, property and equipment shed at Balboa, and yard office in the Balboa yards of the Panama Railroad.

Efforts to prevent damage by termites continued and were generally very successful. There have been few instances in which the termites have succeeded in making their tunnels beyond the down-turned edges of metal plates projecting over the tops of concrete supports for buildings, though they may have built as many as half a dozen tunnels on the under side of the plate. The activity of these pests is illustrated by their having used a strand of a spider's web as support

for a tunnel to advance over the edge of a metal plate whence they proceeded upward to the wood.

QUARTERS FOR EMPLOYEES

Gold employees.—With reductions in force, retirements, etc., the excess of applicants over the number of available family quarters has fallen lower than for years past. On June 30, 1933, there were 25 accepted applications on file for family quarters in all districts, distributed as follows: Ancon-Balboa, 10; Cristobal, 6; Pedro Miguel, 2. The number at the end of the previous year was 32. A number of families, however, are quartered in old houses which require expenditures for maintenance to an uneconomical degree. Apartments constructed in 1906 and 1907 which should be replaced are listed as follows: Cristobal, 90 family apartments; Gatun, 142 family and 23 bachelor apartments; Pedro Miguel, 140 family and 60 bachelor apartments; Ancon, 365 family and 425 bachelor apartments. A few old frame quarters were sold or demolished during the past year to provide room for new houses on the same sites. Rentals collected exceeded expenses of maintenance and reserves set aside for depreciation by $22,664.10 (sec. V, table 26).

Silver employees.—The demand for quarters for employees on the silver roll remains far in excess of the supply. Present policy, however, is not to increase appreciably the total of apartments but to confine the work primarily to maintanance and replacement. At the close of the fiscal year the accepted applications on file for silver quarters totaled 1,519, distributed as follows: Ancon-Balboa, 905; Cristobal, 483; Pedro Miguel, 92; Gatun, 39. No new silver family quarters were constructed during the year. Approximately $12,000 was expended on repairs to family quarters at Camp Bierd, and extensive plumbing improvements in quarters in all districts, to cost about $20,000, were begun. The cost of operation and maintenance exceeded the rents collected and the deficit was covered by an item of $95,000 allotted annually in the appropriations for this purpose.

MOTOR AND ANIMAL TRANSPORTATION

The transportation division of the supply department continued in charge of the operation and maintenance of all motor and animal transportation furnished to all departments and divisions of the Canal and Panama Railroad. The truck and chauffeur service which was being furnished to the contractors at Madden Dam for hauling cement from the railroad siding to the dam site was discontinued during the year after the contractors had purchased equipment and secured their own operators.

During the year 21 new cars and trucks were purchased and 23 were retired. There were on hand at the close of the year 327 cars and

trucks, 6 trailers, 12 motorcycles, 12 mowing machines, and 17 mules. Revenues exceeded expenditures for the fiscal year by $24,319.17, as compared with a profit of $14,008.49 in the preceding year.

PANAMA CANAL PRESS

The Panama Canal Press carries in stock and manufactures such necessary stationery, forms, etc., and does such miscellaneous printing as required on the Isthmus in connection with the operation of the Panama Canal and the Panama Railroad. The manufacturing output for the current year amounted to $154,523.54, as compared with $150,731.54 for the previous year, an increase of $3,792. The excess of revenues over expenditures was $21,009.43 for the year (sec. V, table 26). The annual inventory value of material on hand at the close of the year was $59,323.62, as compared with $79,731.07 at the end of the preceding year.

REVENUES DERIVED FROM THE RENTAL OF LANDS IN THE CANAL ZONE

Rentals on building sites and oil-tank sites in the Canal Zone totaled $49,337.25 for the year, as compared with revenues of $42,045.58 in 1932. Rentals on agricultural lands in the Canal Zone totaled $20,330.79, as compared with $24,511.59 for the preceding year.

At the close of the fiscal year a total of 1,750 licenses were in effect, covering 4,178½ hectares (10,325 acres) of agricultural land within the Canal Zone. This is a reduction of 50 in the number of licenses as compared with the close of the preceding fiscal year and a reduction in the area held under license of 191 hectares.

EXPERIMENTAL GARDENS

Operations of the Canal Zone experiment gardens were curtailed considerably during the year as the result of reducing the allotment from $24,000 to approximately $14,700. This necessitated furloughing some of the force and neglecting some of the plants, including the 8-acre plantation of chaulmoogra-oil trees on the Chagres River. One of the notable features of the year's work was the fruiting of 50 to 60 mangosteen trees which had grown from plants supplied about 9 years ago by the United States Department of Agriculture. The seeds were saved when the fruit was consumed and it is believed that this fruit can shortly be well established in tropical America. The gardens were active also in the development of the cashew, which is indigenous to tropical America but has come into recent notice in the United States through the importation of cashew nuts principally from British India. Seeds of a tree yielding antilepric oil, the Sapucainha, *Carpotroche basiliensis*, were received by air express

from Brazil early in 1932, germinated well, and during the past year strong plants were set out in permanent positions. Work was continued in the introduction and propagation of plants producing rotenone which can be used as the basis for the manufacture of insecticides. The hardy growth of a row of teak trees about 9 years old at the gardens led the director to the suggestion that a small experimental forest of teak might be established in the Canal Zone, in view of the success of the trees at the gardens and the unusual value of teakwood.

Sales of trees, plants, propagating material, and prepared soil from the nursery approximated $5,750 during the year, which is a higher figure than for any previous period of 12 months and represents a considerable activity, in view of the low prices which are charged. Sales are made to other branches of the Canal organization and to individuals and companies in the Canal Zone, Panama, Central and South America, and, in a few cases, in the United States.

BUSINESS OPERATIONS UNDER THE PANAMA RAILROAD

Many of the business activities on the Isthmus connected with the operations of the Canal are conducted with funds of the Panama Railroad Co. Included in these are the wharves and piers at the harbor terminals, the commissary system, coaling plants, hotels, and various minor activities, as well as the Panama Railroad itself. In this report only the major features of these operations are noted in their relation to the Canal administration as a whole. Details are given in the annual report of the Panama Railroad, which is published separately.

The operations of the railroad proper, harbor terminals, coaling plants, stables, and baggage transfer were continued throughout the year under the direction of the general manager of the railroad; the telephone system under the electrical engineer of the Panama Canal; renting of lands and buildings under the land agent; and the commissaries, Hotels Washington and Tivoli, plantations, dairy farms, and cattle industry under the chief quartermaster of the Panama Canal.

Business operations on the Isthmus, carried on with Panama Railroad funds, yielded a profit of $784,432.28 for the fiscal year, as compared with $782,464.49 in 1932, an increase of $1,967.69 or approximately one fourth of 1 percent.

A summary of 1933 operations is given in the paragraphs following.

RECEIVING AND FORWARDING AGENCY

Harbor terminals.—The gross revenue from harbor terminal operations during the fiscal year amounted to $1,257,256.58; operating expenses were $899,804.72, leaving a net revenue of $357,451.86, as compared with $286,379.97 in 1932.

There were 1,357,369 tons of cargo stevedored, and transferred, as compared with 1,301,370 tons in 1932, an increase of 55,999 tons. During the year 3,593 cargo ships and 900 banana schooners were handled, as compared with 3,480 cargo ships and 1,020 banana schooners in 1932. Agency service was furnished to 197 commercial vessels, as compared with 192 last year.

Canal Zone for orders.—As an aid in the distribution of goods to areas served by carriers using the Panama Canal or its terminal ports, there was established in 1925 the arrangement known as "Canal Zone for orders." Under this system merchandise is shipped to Canal Zone ports (Cristobal or Balboa) to be held there in warehouses of the Panama Railroad Co. for orders. Such cargo or integral parts of it may be withdrawn and delivered locally or forwarded as the consignor or consignee may desire, except that goods for use in the Canal Zone or the Republic of Panama, by other than those entitled to free-entry privileges, are released only upon the presentation of satisfactory evidence of payment of the proper duty to the Republic of Panama. Many different commodities were handled in this manner during the year; the total cargo received under the arrangement was 10,979 tons. This was a decrease of about 22 percent from the tonnage received during the preceding year. The revenue for handling and storage amounted to $28,033.91, as compared with $37,159.87 in 1932.

COMMISSARY DIVISION

Total gross receipts were $7,311,894.34, as compared with $8,347,226.33 in 1932, a decrease of $1,035,331.99. The monthly average sales decreased from $695,602.19 to $609,324.53.

The inventory value of merchandise on hand at the close of the fiscal year was $1,670,000, as compared with $1,865,000 at the close of the year 1932. The ratio of sales to inventory indicates a theoretical stock turnover every 2.74 months.

Sales.—The distribution of sales as compared with sales in the 2 preceding years was as follows:

	1931	1932	1933
United States Government (Army and Navy)	$1,455,011.66	$1,069,871.40	$964,376.75
The Panama Canal	701,334.95	626,585.66	562,851.24
Commercial ships	789,365.78	458,943.30	294,416.69
Panama Railroad	299,818.15	236,825.73	180,451.53
Individuals and companies	685,067.17	527,791.93	493,475.57
Employees	6,546,485.93	5,768,104.96	5,107,704.11
Gross sales	10,477,083.64	8,688,122.98	7,603,275.89
Less discounts, credits, etc	408,883.04	340,896.65	289,895.05
Revenue from sales	10,068,200.60	8,347,226.33	7,313,380.84
Supplies for expenses:			
Retail commissaries and warehouses	47,912.84	41,796.53	33,971.25
General	4,376.65	2,623.87	1,640.31
Plants	32,796.89	26,016.66	21,679.97
Total	85,086.38	70,437.06	57,291.53
Lost by condemnation, pilferage, shrinkage, clerical errors, etc.	215,794.35	135,304.27	105,536.52
Grand total	10,369,081.33	8,552,967.66	7,476,208.89

Purchases.—Purchases during the year aggregated $4,850,329.30, a decrease of $737,060.22, or 13.2 percent, as compared with the preceding year. The following tabulation shows the value of the various classes of materials purchased, and the market in which purchased, as compared with the 2 preceding years:

	1931	1932	1933
Groceries	$1,548,080.12	$1,305,899.68	$1,234,567.33
Candies	67,331.34	52,660.91	55,165.39
Hardware	535,034.71	383,234.00	315,525.94
Dry goods	1,096,416.14	841,106.20	726,708.17
Shoes	299,364.78	191,066.02	146,578.30
Cold storage	1,548,791.97	1,213,423.68	1,092,113.73
Tobacco	424,311.36	327,685.92	252,061.17
Cattle and hogs	640,918.70	261,507.06	124,465.53
Milk and cream	178,507.92	164,719.51	153,383.45
Eggs	201,109.50	166,926.42	232,687.89
Butter	195,428.96	160,252.79	138,553.26
Raw material	437,442.08	427,159.61	318,784.87
Toys	46,825.28	44,542.78	21,669.33
Stationery	47,717.63	47,204.94	38,264.94
Dressed beef	6,536.25		
Total	7,273,816.74	5,587,389.52	4,850,329.30
Place of purchase:			
United States	5,171,322.77	4,192,222.93	3,798,356.49
Europe and Orient	777,966.58	621,423.42	482,590.29
Central and South America	259,255.91	145,085.99	131,284.11
Cattle Industry	750,313.47	391,509.92	236,646.13
Panama Canal	90,871.54	69,947.45	70,558.08
Local	224,086.47	167,199.81	130,894.20
Total	7,273,816.74	5,587,389.52	4,850,329.30

Manufacturing plants.—The output of the various manufacturing plants and laundry during the year had a total value of $1,506,092.22, as compared with $1,763,026.43 in the preceding year, a decrease of $256,934.21, or 14.6 percent. The principal products of the major plants and their value were as follows:

The output of the bakery included, 4,964,778 loaves of bread, 1,623,505 rolls, and 393,572 pounds of soda crackers, together with cakes, pies, doughnuts, etc., to the total value of $286,842.65.

The coffee-roasting plant turned out 253,135 pounds of coffee, 17,377 pounds of roasted peanuts, 28,254 pounds of corn and cornmeal, and 887 pounds of roasted almonds, to the total value of $71,236.43.

The principal output of the ice-cream and milk-bottling plant consisted of 841,690 quarts of milk, 58,630 gallons of ice cream, and 24,081 quarts of cream, with a combined value of $259,988.53.

The amount of ice manufactured during the year was 28,388 tons, valued at $206,657.38.

The value of items manufactured in the industrial laboratory totaled $216,662.47.

The abattoir, sausage factory, and pickling department turned out 1,461,577 pounds of dressed beef and various byproducts to the total value of $226,716.38.

The number of pieces of laundry handled was 6,529,906, and receipts aggregated $237,988.38.

HOTELS AND RESTAURANTS

The Hotels Tivoli and Washington, at the two ends of the Canal, are operated as adjuncts to the Canal for the purpose of providing suitable accommodations to people having business with the Canal, foreign visitors, tourists, visiting Government officials, and others. The cost of operating the Hotel Tivoli during the year was $170,769.40, which was $60,518.92 more than the revenue derived. The operating cost of the Hotel Washington during the year was $128,656.12, which was $43,368.12 more than the revenue derived. Operating expenses at both hotels included increases in unexpended reserves as follows: Tivoli, $11,325.60; and Washington, $13,274.30.

The restaurants and silver messes were operated under contract during the year with the exception of messes for both gold and silver employees in construction camps, etc., which were operated by the Panama Canal.

CATTLE INDUSTRY

Beef cattle.—During the year 2,105 head of fat steers were sold to the commissary division, of which 1,831 were the balance due under purchase contract from a cattle dealer in Cuba, 133 head were sent in from the cattle-industry pastures, and 141 were purchased in the Republic of Panama. No beef cattle were on hand as of June 30, 1933.

Dairy farm.—The total milk production at the Mindi dairy, amounted to 208,552 gallons for the year as compared with 203,007 gallons in 1932. Two bulls and 101 cows were purchased during the year, and a total of 751 head were on hand as of June 30, 1933.

PANAMA RAILROAD CO. LANDS AND LEASES

At the close of the fiscal year 1,430 leases and 17 licenses were in effect covering the use of Panama Railroad properties in the cities of Panama and Colon. The income derived by the Panama Railroad from these leases and licenses amounted to $283,675.70.

The income decreased $45,409.50, or 13.8 percent from that in the previous year. This was due largely to a discount of 25 percent given to all lessees who were paying the full commercial rental and paid their accounts for the first three quarters of the fiscal year before April 30, 1933; the discount amounted to $43,871.95. The reduction was granted in view of the business depression.

TELEPHONES AND TELEGRAPHS

The gross revenue from the operation of telephones, electric clocks, and electric printing telegraph machines amounted to $242,089.20, and the total expenses were $185,810.23, leaving a net revenue of $56,278.97, as compared with $50,042.89 for the preceding year, or an increase of $6,236.08 for the year.

During the year 980 telephones were installed and 1,163 were discontinued, making a net decrease of 183 telephones for the year. At the end of the year the telephones on the system numbered 2,766 as compared with 2,949 at the end of the previous year.

A total of 20 automatic printing telegraph typewriters were in use at the end of the year; 12 in use by the Panama Canal and 8 by commercial enterprises. Electric clocks in service at the end of the year numbered 64, a decrease of 10. Twenty Morse telegraph stations were in service throughout the year.

COAL

The sales of coal from the plants at Cristobal and Balboa totaled 39,327 tons during the year, as compared with 65,463 tons in 1932, and were the lowest for any year since the plants have been in operation. Purchases during the year totaled 41,945 tons. The cost of sales, including operating expenses, was $332,494.02 and revenue was $261,716.07, resulting in a loss of $70,777.95, as compared with a loss of $159,932.23 in 1932. The consolidation of the coaling plant organization with that of the receiving and forwarding agency, effective October 1, 1932, reduced the operating expenses materially. The selling prices of coal at the plants remained unchanged throughout the year, at $6.25 per ton at Cristobal and $9.25 at Balboa, for run-of-mine coal, Navy standard, Pool No. 1, Pocahontas or New River.

PANAMA RAILROAD

The gross revenues during the fiscal year 1933 from the operations of the Panama Railroad proper (not including subsidiary business activities) amounted to $1,328,229.81; the gross operating expenses were $1,204,305.19; resulting in a net revenue of $123,924.62, as compared with $56,588.80 last year, an increase of $67,335.82.

Tonnage of revenue freight transported during the year aggregated 292,525 tons, as compared with 263,527 tons during 1932, an increase of 28,998 tons.

Statistics covering the various features of railroad operations during the past three years are presented in the following table:

	1931	1932	1933
Average miles operated, Colon to Panama	47.61	47.61	47.61
Gross operating revenue	$1,685,607.81	$1,433,719.13	$1,328,229.81
Operating expenses	$1,528,555.62	$1,377,130.33	$1,204,305.19
Net operating revenue	$157,052.19	$56,588.80	$123,924.62
Percent of expense to revenue	90.68	96.05	90.66
Gross revenue per mile of road	$35,404.49	$30,113.82	$27,898.12
Operating expense per mile of road	$32,105.77	$28,925.23	$25,295.21
Net revenue per mile of road	$3,298.72	$1,188.59	$2,602.91
Number of passengers carried:			
First class	200,599	184,307	168,344
Second class	293,687	225,647	194,765
Total	494,246	409,954	363,109
Revenue per passenger-train mile	$4.77	$4.17	$3.88
Revenue per freight-train mile	$11.18	$9.66	$9.47
Total revenue train mileage	196,651	193,667	186,598
Railroad revenue per train-mile	$8.57	$7.40	$7.12
Railroad operating expense per revenue train-mile	$7.77	$7.11	$6.45
Net railroad revenue per revenue train-mile	$0.80	$0.29	$0.67
Freight, passenger, and switch locomotive mileage	323,501	307,539	282,502
Work-train mileage	[1] 10,394	5,116	[1] 11,266
Passenger-train mileage	111,718	111,592	108,257
Freight-train mileage	84,933	82,075	78,341

[1] Overhaul of locks occurred in this year.

PANAMA RAILROAD STEAMSHIP LINE

The gross operating revenue for the steamship line for the fiscal year ended June 30, 1933, amounted to $939,880.67, and the gross operating expenses amounted to $1,260,365.32, resulting in a net deficit from operations of $320,484.65. The operating deficit compared with the net loss for the fiscal year ended June 30, 1932, of $297,079.91, shows a decrease in the net revenue of $23,404.74.

For the year ended June 30, 1933, the tonnage carried by the steamship line amounted to 116,148 tons, as compared with 140,429 tons in the previous year.

The steamship line carried freight and passengers for account of the Panama Canal and other departments of the Government of the United States at material reductions from tariff rates, which amounted to the important sum of $420,642.54. Had regular tariff rates been received by the steamship line for such freight and passenger services performed for the Panama Canal and other Government departments, its income would have been increased by $420,642.54 and its operations for the year would have resulted in a profit of $100,157.89.

SECTION III

ADMINISTRATION

DEPARTMENTS

The organization of the Panama Canal embraces five major departments on the Isthmus, with the Panama Railroad Co. closely affiliated, and an office in Washington. The departments on the Isthmus are operation and maintenance, supply, accounting, executive, and health.

CHANGES IN ORGANIZATION AND PERSONNEL

The section of coaling plants was abolished, effective October 1, 1932, through consolidation with the receiving and forwarding agency of the Panama Railroad. The former superintendent of coaling plants, Mr. A. L. Prather, was appointed assistant receiving and forwarding agent, effective the same date.

The name of the division of lock operation was changed to "Locks Division" on January 1, 1933.

Upon the expiration of his 4-year term as Governor on October 20, 1932, Brig. Gen. Harry Burgess, United States Army, was relieved from duty with the Panama Canal and the present incumbent was appointed to fill the vacancy, effective October 21, 1932. The position of engineer of maintenance, thus vacated, was filled by the appointment of Lt. Col. C. S. Ridley, United States Army, who had been assigned to duty with the canal with such appointment in view, arriving on the Isthmus on September 7, 1932, when he was appointed assistant to the engineer of maintenance for the interim. Lieutenant Colonel Ridley had served as assistant engineer of maintenance from May 10, 1921, to April 19, 1924, on which date he was relieved from duty with the Panama Canal.

The deaths of General and Mrs. Burgess, occurring on March 18 and June 2, 1933, respectively, in the United States, occasioned deep regret among thousands on the Isthmus to whom their life here had endeared them.

Col. O. G. Brown, United States Army, was appointed superintendent of Gorgas Hospital, September 10, 1932, vice Col. A. M. Whaley, United States Army, relieved from duty with the Panama Canal.

Mr. W. L. Hersh was appointed electrical-mechanical engineer for the Madden Dam division, effective November 18, 1932. Mr.

Hersh was formerly electrical engineer of the Panama Canal, from which position he resigned on August 22, 1927.

Major William E. R. Covell, United States Army, was appointed assistant to the Governor, May 9, 1933, in anticipation of his appointment as assistant engineer of maintenance on August 29, 1933, vice Maj. Joseph C. Mehaffey, United States Army, upon the relief of the latter from duty with the Panama Canal.

Mr. Richard C. P. Thomas was appointed Judge of the District Court of the Canal Zone by the President, effective June 15, 1933, vice Judge James J. Lenihan, who had resigned on May 8, 1933.

Lt. Comdr. Leon B. Scott, United States Navy, was appointed captain of the port, Balboa, June 18, 1933, vice Comdr. Guy C. Barnes, United States Navy, relieved from duty with the Panama Canal.

FORCE EMPLOYED

The supervisory, technical, higher clerical, and highly skilled mechanical employees, consisting primarily of citizens of the United States but including a few others, are employed on what is known as the "gold roll"; the rest of the force, principally aliens but including a few citizens of the United States, on low-paid work, are designated as "silver" employees. These terms are a heritage from the former tropical practice of paying Americans and Europeans in gold because of its stability, while the native or tropical labor was paid in local currency, based on silver.

Force reports are made on the first and third Wednesday of each month. The distribution of the force, by organizations, is shown in the force reports published below for the third Wednesday in June in 1932 and 1933. For gold employees the force report shows all who were in service on the date of the report, for silver employees only those who were at work on that date. Based on the last force report for June of each year, the gold force decreased from 3,148 on June 15, 1932, to 3,028 on June 21, 1933, a change of 120 or 3.81 percent; the silver force increased from 9,120 to 9,575, a gain of 455, or 4.75 percent. The combined force changed from 12,268 to 12,603, an increase of 335, or 2.66 percent. The silver force is likely to fluctuate sharply, due to seasonal or temporary employment; its average during the past year was lower than in the preceding year.

The gross amounts passed for payment of salaries and wages during the year were as follows: Panama Canal, gold roll, $6,960,826.53, silver roll, $4,397,484.39, total, $11,358,310.92; Panama Railroad, gold roll, $1,021,316.91, silver roll, $1,452,116.85, total, $2,473,433.76. The total payments on the gold roll were $7,982,143.44, on the silver roll, $5,849,601.24, making a grant total of $13,831,744.68, as compared with $15,806,240.12 in the fiscal year 1932. The amounts shown are the gross earnings, and for the fiscal year 1933 they are the

earnings after the deduction of the amounts required to be deducted under the Economy Acts. For both years they are the earnings prior to the deductions for services rendered, such as for commissary books, rent, retirement fund, etc. In the fiscal year 1933 the Economy Act deductions totaled $1,230,132.66 and the miscellaneous deductions for services were $5,464,983.18.

GOLD EMPLOYEES

The distribution of the gold personnel on the last force report days of the 2 years is shown in the following tabulation:

Department or division	Gold force		Decrease	Increase	Net decrease
	June 15, 1932	June 21, 1933			
Operation and maintenance:					
Office	53	54		1	
Electrical division	156	145	11		
Municipal engineering division	81	99		18	
Locks division	235	207	28		
Dredging division	173	163	10		
Madden Dam division	40	65		25	
Mechanical division	446	399	47		
Marine division	185	177	8		
Fortifications	17	12	5		
Total, operation and maintenance	1,386	1,321	109	44	65
Supply department:					
Quartermaster	191	182	9		
Commissary division	230	221	9		
Cattle industry	2	2			
Hotel Tivoli	8	7	1		
Hotel Washington	7	7			
Transportation	81	74	7		
Total, supply department	519	493	26		26
Accounting department	194	187	7		
Health department	277	276	1		
Executive department	573	565	8		
Total, 3 departments	1,044	1,028	16		16
Panama Railroad:					
General manager	24	23	1		
Transportation	77	77			
Receiving and forwarding agency [1]	73	86		13	
Coaling stations [1]	25		25		
Total, Panama Railroad	199	186	26	13	13
Grand total	3,148	3,028	177	57	120

[1] Coaling stations were consolidated with receiving and forwarding agency, Oct. 1, 1932.

Increases occurred in 4 of the 22 units of the organization, as reported above, decreases in 15. With the consolidation of the coaling stations with the receiving and forwarding agency the number of organizations reported in the statement of force became 21. The increase of one in the office organization for operation and maintenance was due to the appointment of an assistant to the Governor in preparation for the appointee's relieving the assistant engineer of maintenance upon the expiration of the latter's tour of duty with the Canal. The increase of 18 in the force of the municipal engineering division was

because of work on the enlargement of the Cristobal drydock and grading and road jobs under the allotment for relief of unemployment. The force of the Madden Dam division increased by 25 primarily because the contractor placed his work on a 3-shift basis, necessitating extension of the supervisory and inspectional force. The increase of 13 at the receiving and forwarding agency was due to incorporating the coaling plants force; the total force for the two organizations decreased by 12.

Decreases were due to the completion of projects or to lessened activities generally resulting from the decrease in traffic. The changes in force are not always mathematically proportionate to the changes in business; in lieu of reduction of force many employees were furloughed at intervals, so as to afford part-time employment to as many as possible and thus to distribute earnings, and in smaller units of the organization no proportionate reduction is practicable.

Additional decreases in force were made effective with the termination of work on June 30, 1933, largely because of reduced allotments for the fiscal year 1934.

RECRUITING AND TURNOVER OF FORCE

The following table shows additions to the gold force and separations from it in the fiscal year from July 1, 1932, to June 30, 1933, inclusive. Employments are classified as made in the United States or on the Isthmus and separations are classified by cause. This table covers the fiscal year and is more exact than the comparison of force on June 15, 1932, with that on June 21, 1933. It includes a number of separations made after June 21, the majority on June 30, 1933:

	Operation and maintenance	Executive	Supply	Health	Accounting	Panama Railroad	Total
Employed or reemployed in the United States	6	3	3	29		1	42
Employed or reemployed on the Isthmus	82	16	16	13	2	19	148
Total additions	88	19	19	42	2	20	190
Resigned	24	21	5	24	5	22	101
Retired:							
Age	11	2	4	3	1	9	30
Disability	13	3	4	2	1	5	28
Involuntary separation	2	6	3		1	3	15
Voluntary separation	1			1			2
Involuntary separation (30 years' service)	3	2			2		7
Died	11	2	2	1		2	18
Reduction of force	30	2	26	4	8	4	74
Expiration of temporary employment	47	4	12	13	1		77
Discharged for cause	2	1	3	1		2	9
Insane [1]		1					1
Failure to report back from leave						1	1
Transferred to silver roll	2						2
Completion of apprenticeship	10						10
Total separations	156	44	59	49	19	48	375

[1] Retired for disability—insane.

Separations, the Panama Canal	327	Separations, Panama Railroad	48
Additions, the Panama Canal	170	Additions, Panama Railroad	20
Net separations	157	Net separations	28

The above shows a total decrease of 185 in the combined gold force.

Among the 82 employees retired, as listed above, were 7 in the Panama Canal organization who were separated from the service involuntarily and, having had 30 years or more of service under the Government, were retired on full annuity less 5 percent, full annuity to be paid upon their reaching the age of 62 years. This was under the provisions of the act of June 16, 1933.

The number of persons tendered employment through the Washington office of the Panama Canal, all above the grade of laborer, was reported by that office as 67, of whom 49 accepted and were appointed, covering 15 different kinds of positions. These figures cover appointments not all of which became effective during the fiscal year. The number actually entering into employment on the Isthmus, through appointment in the United States, is as indicated in the tabulation. Acceptances and appointments through the Washington office were 73.1 percent of the tenders. In the preceding year the tenders numbered 89 and acceptances 58, making the acceptances 65.1 percent of the tenders.

Based on a gold force of 3,111 at the beginning of the fiscal year, as shown in the force report for July 6, 1932, the 375 separations make a turnover rate of 12.05 percent from all causes. For the fiscal year 1932 the rate was 13.4 percent.

When a position is to be filled efforts are made to fill it by promotion from the force already employed or by transfer of an employee whose work in another department is about to terminate. This not only reduces the expenses of recruiting new employees but has the further value of strengthening the morale of the force through giving the employees a reasonable expectation of promotion and continued employment as long as their services are satisfactory, thus building up loyalty to the organization. Of the 190 gold employees employed during the past year, 124, or approximately 65 percent, were reemployments; of these, 109 were reemployed on the Isthmus and 15 in the United States.

At the end of the year the applications on file from residents of the Isthmus for employment on the gold roll numbered approximately 1,100. This is a record number and is due not only to the growth of American families on the Isthmus, with numbers of children reaching employment age, but also to reductions of force, actual and contemplated.

During the year arrangements were made by the Washington office for the transportation of 1,917 persons from the United States to the Isthmus. These included new appointees and employees returning from leave of absence, and members of their families. Of the sailings, 1,765 were from New York, 58 from New Orleans, and 94 from Pacific coast ports.

SILVER EMPLOYEES

The distribution of the silver personnel toward the close of the fiscal year, and toward the close of the preceding year is shown in the following tabulation. The summary is for the days on which the force report is made; the force may change by several hundred within a short time according to fluctuations in the demand for labor.

Department or division	June 15, 1932	June 21, 1933	Decrease	Increase	Net increase
Operation and maintenance:					
Office	41	50		9	
Electrical division	186	181	5		
Municipal engineering division	690	1,053		363	
Locks division	682	701		19	
Dredging division	910	837	73		
Madden Dam division	198	124	74		
Mechanical division	764	745	19		
Marine division	463	553		90	
Fortifications	95	34	61		
Total, operation and maintenance	4,029	4,278	232	481	249
Supply department:					
Quartermaster	1,285	1,438		153	
Commissary division	1,246	1,155	91		
Cattle industry	97	89	8		
Hotel Tivoli	92	90	2		
Hotel Washington	81	78	3		
Transportation	223	216	7		
Total, supply department	3,024	3,066	111	153	42
Accounting department	5	5			
Health department	813	850		37	
Executive department	361	360	1		
Total, three departments	1,179	1,215	1	37	36
Panama Railroad:					
General manager	51	73		22	
Transportation	231	236		5	
Receiving and forwarding agency	513	707		194	
Coaling stations	93		93		
Total, Panama Railroad	888	1,016	93	221	128
Grand total	9,120	9,575	437	892	455

Increases were shown in 9 of the 22 units of the organization, as reported above, and decreases in 12. The increase of 9 shown under "Office" was in the section of surveys and on account of temporary employment of machetemen in a survey of unassigned lands on the west side of the Pacific entrance section of the Canal. In the municipal engineering division the increase of 343 was due primarily to work on the drydock at Cristobal and jobs of grading and road building under an allotment of $184,000 for relief of unemployment. The increase of 19 in the locks division was because of the overhaul of the Pacific Locks, as some of the force were engaged in cleaning up after the resumption of normal operating conditions. In the marine division the increase in traffic occasioned the employment of a greater number of extra deck hands to handle lines in the locks. The increase of 153 in the quartermaster organization was on account of building construction, including work on the Cristobal High School

and quarters in the Cristobal and Ancon-Balboa districts. In the health department the increase of 37 was due to temporary employment on refrigerating, roadway, and other improvements in Gorgas Hospital, an increase of working patients at Palo Seco and to fluctuations in the normal daily force. The increase of 22 in the general manager's division of the Panama Railroad was due to variations in the employment of stowers and truckers in the freight house in Panama City, the number of such employees ranging from 10 or 12 to 50 or more, according to the goods to be handled. Increase of five in the transportation division of the railroad was due to variations in the gangs for track maintenance and among the extra flagmen and brakemen. At the receiving and forwarding agency the increase of 194 was due in part to inclusion of the force at the coaling stations and in part to use of a greater number of dock employees, longshoremen, stowers, truckers, etc., according to the vessels in port and the cargo to be handled.

No difficulty was experienced in maintaining the force; on the contrary, unemployment and the pressure for work presented one of the problems of the year and occasioned efforts to afford employment through grading and road-building jobs which employed a maximum of labor. The total number of employments in the fiscal year was 4,856 and the number of separations was 4,258. Based on a silver force numbering 9,116 on July 6, 1933, the 4,258 separations make a turnover rate of 46.9 percent. At the end of the year the number of persons seeking employment on the silver roll was approximately 3,000. Some furloughing among silver employees, as among gold, was necessary during the year to conserve funds and to distribute employment.

WAGE ADJUSTMENTS

GOLD EMPLOYEES

The Panama Canal Act provides that salaries or compensation fixed thereunder by the President, or by his authority, "shall in no instance exceed by more than 25 percent the salary or compensation paid for the same or similar services to persons employed by the Government in continental United States." Concurrently with this limitation it has been the policy to pay generally to United States citizens employed on the gold roll the full 25 percent above pay for similar work in the United States, within the limitations of appropriations and subject to the preservation of coordination within the organization.

In conformity with the provisions of the Economy Acts of June 30, 1932, and March 3, 1933, and the policy of the President since the Economy Act of March 20, 1933, went into effect, the wage and salary schedules for gold employees in effect on June 30, 1932, remained unchanged throughout the year except for the establishment of a few

rates not provided in the schedules then in effect. Percentage deductions from pay were made as required by the Economy Acts.

The wage board, consisting of the assistant engineer of maintenance and a representative, selected by the organizations of employees and approved by the Governor, held six meetings during the year in connection with such matters as minimum time allowance for hourly employees, subsistence on floating equipment, rates for chauffeurs, etc.

The salary board, composed of the heads of the nine major departments and divisions of the Panama Canal and Panama Railroad, held no meetings during the year.

The complaints board, for the purpose of investigating and reporting on complaints of employees about working conditions and administrative actions, etc., referred to it by the Governor, held no meetings during the year, and no cases were referred to it.

SILVER EMPLOYEES

In line with reductions in the cost of living and reductions in the pay of employees receiving over $1,000 per year as the result of the Economy Act of June 30, 1932, rates of pay in the schedule for silver employees not affected by the Economy Act and in excess of $20 per month were reduced, effective August 1, 1932, as follows: Hourly employees, 1 cent per hour; monthly employees, $2.50 per month; per diem employees, 10 cents per day. Such reductions remained in effect until April 1, 1933, when the previous schedule was restored to its status as of June 30, 1932, and all employees became subject to the 15 percent deduction from compensation required by the Economy Act of March 20, 1933.

The silver wage board held one meeting during the year, in connection with adjustment of the schedule of rates of pay in view of the decreased cost of living. Revision of the index of the cost of living was directed and undertaken in collaboration with representatives of the organized West Indian employees.

The average rates paid to alien employees as of October 1, 1932, when the annual general survey was made, as compared with 9 preceding years, were as follows:

	Average rates			Average rates	
	Monthly employees (per month)	Hourly employees (per hour)		Monthly employees (per month)	Hourly employees (per hour)
Nov. 1, 1923	$55.27	$0.2312	Oct. 1, 1928	$56.44	$0.2496
Nov. 1, 1924	54.74	.2323	Oct. 1, 1929	55.37	.2450
Nov. 1, 1925	55.28	.2835	Oct. 1, 1930	57.09	.2560
Nov. 1, 1926	55.40	.2395	Oct. 1, 1931	57.46	.2460
Oct. 1, 1927	54.88	.2411	Oct. 1, 1932	54.34	.2400

The average rate per month, combining the monthly rates with the hourly rates on the basis of 208 hours of working time per month, was $52.41 for a total of 9,594 positions. At the time of the preceding annual survey this average was $54.33 for 10,931 positions. The decrease of $1.92 was due principally to the reductions in the schedule which went into effect on August 1, 1932.

The average rates of pay shown above were ascertained by making a compilation and classification covering the rates of pay of all alien employees in the service. The figures shown above do not represent average earnings but represent the average rates of pay at which these employees were carried on the time rolls. Average yearly earnings fall somewhat below the annual equivalents of the average monthly and hourly rates shown above, for the reason that these employees do not receive leave of absence with pay excepting sick leave and, consequently, any absences from duty not covered by a physician's certificate are without pay.

Under Executive orders, the maximum rate of compensation authorized for alien employees is $80 per month, or 40 cents per hour, with the exception that authority has been granted to exceed these maximum rates in the cases of not more than 112 alien employees of the Panama Canal and Panama Railroad Co. The basis hourly rate of compensation for common labor has remained at 20 cents an hour since 1922, with subsequent provisos that 21 or 22 cents may be used as the entrance rate.

Wages of alien employees of the Panama Canal and Panama Railroad Co. bear no definite relation to wages of corresponding classes of employees in the United States but are generally equal to or slightly in excess of rates prevailing for tropical labor throughout the Caribbean area. Surveys of the wages prevailing for tropical labor throughout the British West Indies and the countries of Central America, as well as selling prices of certain selected staple commodities, are made from time to time for purposes of comparison with the pay and costs in the Canal service.

As a further aid in maintaining an equitable scale of rates of pay and maintaining the standard of living of these employees, a weighted price index, reflecting price changes in the commissaries on more than 100 staple items in common use among these workers, has been carried forward for a number of years. With 100 adopted as an index figure reflecting commissary prices in 1914, the index rose to a peak of 168.98 in 1921, but since declined gradually until the 1932 index figure showed an increase in the cost of living over 1914 of 6.16 percent.

Upon the recommendation of the silver wage board it was decided to establish a new index, based upon 1932 prices and to correlate the wage scale to the more recent costs with consideration of revision in

the expenses of employees on account of changes in conditions since the years of Canal construction, and compilation of data to determine this index was begun.

SUPERANNUATED ALIEN EMPLOYEES

Alien employees of the Panama Railroad Co. who are no longer able to perform useful service in any capacity are retired from the rolls and given either a lump sum payment, with repatriation, or a small annuity. Since June 1, 1928, 14 such employees have been given lump sum payments ranging from $25 to $500 and 134 employees were granted pensions ranging from $7 to $25 per month. Of the 134 pensioned 17 had died to the end of the fiscal year 1933 and one annuity was canceled, leaving 116 on the pension roll at the end of the year. The average payment being made at the end of the year was $12.94 per month.

The foregoing applies only to superannuated alien employees of the Panama Railroad Co. No provision exists for the payment of pensions to superannuated alien employees of the Panama Canal.

To assist somewhat in meeting this problem, domiciliary care for superannuated alien employees has been provided in connection with the insane asylum at Corozal, but few of the employees are willing to stay there, and in any event the facilities available do not allow taking care of any considerable number of employees, some of whom have one or more dependents. Moreover, the per capita cost of institutional care thus furnished exceeds the amount it would cost to provide a small pension and permit the employee to live his normal life among people of his own race.

The remedy for this situation lies in appropriations by Congress. The form of legislation desired, and further explanation of the need of it, and of the cost, are presented below under "administrative problems."

PUBLIC AMUSEMENTS AND RECREATION

Operation of the Canal clubhouses, with their related activities of playgrounds, kindergartens, athletic fields, swimming pools, etc., continued as in past years but with a reduction in the amount appropriated by Congress, and with a greater proportion of the expense borne by the receipts from charges for admission and services. As private industry is not permitted within the Canal Zone the supplying and supervision of recreational facilities for the Canal employees and their families is a function of the Canal organization.

The appropriation in the fiscal year 1933 was reduced by $50,000 to a net of $60,709 and the balance of the operating expenses was made up from receipts from charges, amounting to $482,029, and reserves.

Following the opening of Thatcher Highway, with ferry at Balboa, on September 1, 1932, a bathhouse was opened at Farfan Beach for gold employees. This is in charge of a gold employee of the boat club at Balboa with a silver attendant at the beach, who sells refreshments. Attendance has averaged about 25 persons a day, with about 500 as a maximum. Attendance is affected greatly by the stages of the tide and by ferry connections.

A beach for colored employees at the Pacific end of the Canal was opened on the west side of the Canal, opposite La Boca and to the south of the ferry slip in the direction of Farfan Point. Steps and a path were constructed to lead over the hill back of rear range tower no. 4 but the beach cannot be reached by road. It has been named "Hideaway Beach" and has proved popular as a picnic grounds. The attendance on Sundays and holidays is estimated as ranging from 500 to 1,000 persons.

The clubhouses operated in the year were as follows: Gold clubhouses at Ancon, Balboa, Pedro Miguel, Madden Dam, Gatun and Cristobal, with a boathouse at Balboa and bathhouse at Farfan, and playgrounds at Ancon, Balboa, Pedro Miguel, Gatun, and New Cristobal; clubhouses for the silver employees were operated at La Boca, Red Tank, Paraiso, Madden Dam, Gatun, and Cristobal, with a clubroom at Gamboa, and playgrounds at La Boca, Red Tank, Paraiso, Gatun, Camp Bierd, and Mount Hope. The business activities at the New Cristobal clubhouse were discontinued during the year, due to objections by officials of Colon. The clubhouses are open from 7 a.m. to 11 p.m. daily, including Sundays and holidays. Their activities and equipment vary somewhat, but the average clubhouse contains a motion-picture hall, a soda fountain where soft drinks, ice cream, and light food may be procured, candy and cigar counters, billiard and pool tables, bowling alleys, reading and card rooms, news stand, barber shops, etc. Swimming pools, baseball parks, tennis courts, playgrounds, and other outdoor recreational facilities are operated under the supervision of clubhouse personnel. Kindergarten work and supervised games and play are carried on for children from 4 to 6 years of age. Baby clinics are conducted weekly, a registered nurse from the health department being in charge.

During the past year, in addition to the moving pictures exhibited practically every evening, there were various entertainments in the theaters, such as concerts, lectures, patriotic exercises, theatricals, dancing classes, etc., and at Balboa a traveling circus exhibited 3 days on the stadium grounds. New seats, upholstered in leather, were installed in the moving picture halls of the gold clubhouses, except at Madden Dam.

Due to the climate and termites, practically all of the clubhouse buildings are in poor physical condition, and particularly those at Ancon, Balboa, La Boca, and Cristobal should be replaced with new structures.

ADMINISTRATIVE PROBLEMS

Legislation necessary for improvements in the management of the Canal, or for the upkeep or extension of its physical plant, is discussed in the following pages. The form of bills for attaining some desired changes is set forth below, and following the proposed bills is an outline of the reasons why their enactment is advisable.

LEGISLATION PROPOSED

It is desirable to have specific legislation providing in substance as follows:

Pensioning alien employees.—That the Governor of the Panama Canal, under such regulations as may be prescribed by the President of the United States, may pay cash relief to such alien employees of the Panama Canal as may become unfit for further useful service by reason of mental or physical disability resulting from age or disease not the result of vicious habits: *Provided*, That such cash relief shall not exceed $1 per month for each year of service of the employee so furnished relief, with a maximum of $25 per month, nor be granted to any employee having less than 10 years' service with the Panama Canal, including any service with the Panama Railroad Co. on the Isthmus of Panama.

That there be appropriated annually such sums as may be necessary to carry out the provisions of this act.

Repatriation of alien ex-employees.—That the sum of $150,000 is appropriated, out of any money in the Treasury not otherwise appropriated, for expenditure under the direction of the Governor of the Panama Canal for repatriation of unemployed aliens who have been employed by the Panama Canal or Panama Railroad Co. on the Isthmus of Panama for three or more years at any time, and repatriation of members of families of such alien former employees; such expenditures to be for transportation of such alien former employees and members of their families and for the payment of not to exceed $100 in cash to each such alien former employee for assistance in rehabilitation after repatriation. The sum appropriated herein is to be available until expended.

Tolls.—That the sentence of section 5 of the Panama Canal Act, as amended, which reads, "If the tolls shall not be based upon net registered tonnage, they shall not exceed the equivalent of $1.25 per net registered ton, as nearly as the same may be determined, nor be less than the equivalent of 75 cents per net registered ton," is amended to read as follows: "If the tolls are not based upon net registered tonnage, they shall not exceed the equivalent, as nearly as may be determined, of $1.20 per net ton (determined in accordance with the Rules for the Measurement of Vessels for the Panama Canal, prescribed by proclamation by the President, November 21, 1913, as amended from time to time), nor be less than the equivalent, as nearly as may be determined (a) of 75 cents per net ton (determined in accordance with such rules, as amended from time to time) in the case of vessels not in ballast, or (b) of 60 percent of the current laden rate per net ton for each net ton (determined in accordance with such rules, as amended from time to time) in the case of vessels in ballast, *Provided*, that no

charge shall be made for any space which, under definitions to be prescribed by the President, is at all times actually exposed to the weather and the sea, even though such space is occupied."

DISCUSSION OF PROPOSED LEGISLATION

PENSIONS FOR ALIEN EMPLOYEES

American citizens employed by the Panama Canal or Panama Railroad Co. are subject to retirement under the Panama Canal retirement law, but this provision applies only to American citizens. The majority of the Canal and railroad force are aliens, and they are without benefit of legal provision for retirement when, through superannuation or other physical disability, they can no longer perform their work. The Panama Railroad Co. can and does give to such of its alien employees pensions ranging from $7 to $25 per month but there is no authority to do this with employees of the Panama Canal. All that can be done for them now is to offer them care at Corozal Hospital, where there are no accommodations for their families, or to carry them on the rolls at reduced pay, at rates from $15 to $35 per month, to perform such work as they can. It would be much better to pension them outright and let them move away from the sphere of Canal work.

The cost of caring for these employees, on the basis of an average pension of $20 per month, has been estimated by the bureau of efficiency at about $12,000 for the first year, with a gradual increase to a maximum of $121,000 a year for the twentieth year and each year thereafter.

The cost is not high, considering the number of employees concerned, and the relief recommended is considered not only humane but a step toward more efficient operation through weeding out those who are no longer capable of service and then requiring of everyone on the active roll the normal daily performance of service.

REPATRIATION OF UNEMPLOYED ALIENS

The growth of the population of West Indian negroes in the Canal Zone and in the cities of Panama and Colon, near the ends of the Canal, has been in excess of the need of labor and, with the decrease in Canal activities as well as in business in Panama generally, there has been acute unemployment among both West Indians and natives of Panama. Partial relief is sought through repatriating a number of West Indians and their families, and the Republic of Panama has requested that the United States "proceed with the repatriation of unemployed foreign workers who have collected in the cities of Panama and Colon because of being left without work in the Canal Zone.

As these aliens are resident in territory of Panama, the participation of the United States in the movement would be in paying expenses of repatriation. The presence on the Isthmus of many of the aliens is due to their having come to work on the Canal and, while the United States has brought no contract laborers to the Isthmus since 1913, and has regularly offered repatriation to discharged laborers who came to the Isthmus either under contract or on their own account, and has taken the initiative in discouraging further immigration and requesting Panama to restrict it, the fact is recognized that the existing surplus of alien West Indian population in the two terminal cities is detrimental to the interests of Panama and to the relations between that country and the United States, and that it is to the joint interest of the two governments to apply to the situation such remedies as are advisable and practicable.

The regular appropriations for the Canal contain each year an item of $20,000 for expenses of recruiting and repatriation of employees, American and alien. For the fiscal year 1934 about $10,000 will be available for repatriation of aliens and this will be used for transportation only. It may care for all who will apply for repatriation under the present terms. In order that a larger number may be moved, it is proposed that, under the special appropriation recommended, funds be applied to the transportation of aliens who have served 3 years or more with the Panama Canal or the Panama Railroad, and also to giving to each former employee a lump sum of from $25 to $100, according to circumstances, to assist him and his family in becoming established on their return to their native land. The cost of transportation plus the starting fund is estimated to average about $150 per former employee and the figure of $150,000 suggested for the appropriation is to cover the repatriation of approximately 1,000 families. Whether further appropriations for this purpose would be needed or justified during the present depression can be determined later with the benefit of experience gained from the use of the first appropriation. The making of any expenditures under this or subsequent appropriations is to be contingent on the furnishing by the Government of Panama of suitable guaranties for the enforcement of the immigration and registration laws of that country, including particularly the prevention of reentry of persons who may be repatriated at the expense of the United States or the immigration of other aliens of the class which it is proposed to repatriate.

TOLLS—DUAL-MEASUREMENT SYSTEM

The legislation recommended with respect to tolls aims to establish the measurement of vessels and the collection of tolls on the single and uniform basis of the rules of measurement prescribed for the Panama Canal and to remove the variable factor of measurement according

to national registry rules. The reasons for desiring this are to establish a constant and equitable system and to protect the basis of levying tolls, and consequently the revenues of the Government, against variations which may result from the rules for registry measurement in the United States, and changes made in those rules.

On the assumption that the earning capacity of a ship, i.e., the space within it which may be devoted to carrying cargo and passengers is the proper guide for the collection of tolls for the passage of the ship through a canal, and such is the basis at all principal canals in the world, the Panama Canal rules of measurement were devised, after extensive study, to determine that earning capacity precisely and fairly for the varied types of ships. The rules are essentially like the Suez Canal rules, with slight modifications, and their fitness for the purpose for which devised has not been questioned.

Genesis of rules.—The authority for levying tolls is found in the Panama Canal Act of August 24, 1912, as amended. It contains general provisions for the levying of tolls and authorizes the President to establish rules for measurement of vessels and rates of tolls within the limitations set by the act. The act provided that "Tolls may be based upon gross or net registered tonnage, displacement tonnage, or otherwise"; "may be lower upon vessels in ballast than upon vessels carrying passengers or cargo"; "when based upon net registered tonnage for ships of commerce the tolls shall not exceed $1.25 per net registered ton, nor be less than 75 cents per net registered ton"; and "if the tolls shall not be based upon net registered tonnage they shall not exceed the equivalent of $1.25 per net registered ton as nearly as the same may be determined, nor be less than the equivalent of 75 cents per net registered ton."

Pursuant to the authority vested in him by Congress, as above, the President issued a proclamation under date of November 13, 1912, which established rates on commercial ships as follows:

1. On merchant vessels carrying passengers or cargo, $1.20 per net vessel-ton—each 100 cubic feet—of actual earning capacity.
2. On vessels in ballast without passengers or cargo 40 percent less than the rate of tolls for vessels with passengers or cargo.

The determination of the "net vessel-ton" or "net tonnage" on which the charges as above were to be levied was established by the Panama Canal rules of measurement, promulgated by a proclamation of the President dated November 21, 1913, as put into effect immediately upon the opening of the Canal to commercial traffic.

Subsequently, upon a protest of certain ship owners regarding charges on deck cargo, the question of the interpretation of the act of Congress regarding tolls charges was referred to the Attorney General for decision. He decided that the term "net registered tonnage" as used in the act must be interpreted to mean the net tonnage

of a vessel as measured under the rules prescribed by the statutes of the United States.

Inasmuch as the act provided that the tolls charges should not exceed $1.25 per net registered ton, nor be less than 75 cents per net registered ton, in view of the above decision by the Attorney General, the President ordered that rules and regulations be issued with respect to the tolls "so that no tolls shall be demanded or collected upon any vessel of commerce which shall aggregate more than $1.25 upon the net registered tonnage as measured under the statutes of the United States", and so drawn "as to produce a similar result with respect to the minimum that may be charged." It was anticipated by all concerned that the Congress would pass remedial legislation dealing with the subject more completely and satisfactorily, "but", to quote from the letter of the President, "until that course is taken, the way herein suggested seems to me to be the best one to meet the existing situation."

Result of rules.—Net tonnage as measured for national registry is universally lower than the tonnage as measured in units of 100 cubic feet of actual earning capacity, and it is the practice of nations to keep registered tonnage of their ships down, so as to reduce the light dues and port charges based on it. This practice is generally recognized and accepted, much like appraising property for taxation at figures lower than the real worth. As the port charges may be a few cents per net ton, in any event a relatively low figure, the figure for number of tons on which they are levied is not of great importance; also, the rate of port charges can be adjusted upward with consideration of the depressed tonnage. But when it comes to a matter of a charge of $1, more or less, per ton for a service such as transit through a canal which saves the ship thousands of miles, the net tonnage becomes of vital concern.

Since the "United States net" is in nearly all cases considerably lower than the "Panama Canal net" the practical result is that tolls on laden ships are collected on the basis of $1.25 times the United States equivalent net tonnage. This would not be objectionable if the use of United States net tonnage resulted in equitable charges in proportion to the capacity of the ship. However, they were not devised to determine such capacity precisely and fairly and are changed from time to time (usually so as to decrease the net tonnage, by increasing the exemptions from inclusion in net tonnage) and the changes often seem illogical and result in inequities between ships, when used for toll charges. It is to be noted that while the purpose of the Canal rules of measurement is to include all space which can be used for earning revenue, national registry measurement aims often at excluding such spaces from inclusion in net tonnage. The one system is directed toward justice, the other frequently toward privilege.

On ships transiting the Canal in ballast, the rate of 72 cents times the Panama Canal net prevails, except that the amount so derived may not exceed $1.25 times the United States net. Due to these conflicting limitations, many ships with relatively low net tonnage as measured under United States rules pay the same amount for transit when laden as when in ballast. Ballast ships as a class pay considerably more than the amount which is "40 percent less" than the charge for like ships when laden.

The heavier charges on ballast ships caused by the existing rules are one element in the interference with levying equitable charges. Assuming that they should not pay over 60 percent of the amount paid when laden, which was accepted as proper when the Canal rules were made, they are now being rather heavily overcharged as compared with laden vessels.

Difficulties and inequities occur also in levying tolls on laden ships under the dual system, due to the uncertainty and variability of the net tonnage as measured under registry rules. Examples are in the rules concerning shelter deck spaces, passenger cabins, tonnage openings, scuppers, freeing ports, bulkheads, etc., in which some change of ruling in connection with United States measurement may arbitrarily affect the inclusion or exemption of spaces, without relation to the actual value and use of such spaces for carrying cargo. The technical details have been explained in separate reports; the essential point is that the situation results in uncertainty on the part of both the Canal and its users as to the important matter of tolls charges, and such charges are determined to a large extent by the orders and interpretations of an unrelated agency which is concerned with other matters than the justice of Canal tolls.

In individual instances the inequities resulting from application of the United States registry rules may affect a ship or fleet unfairly. Naturally the advantages gained by one group are reflected as disadvantages to their competitors. As applied to traffic as a whole, the factor of the United States rules results in reducing Canal tolls.

Reduction of revenues.—The reduction of revenues from tolls on laden ships occurs because it is possible to reduce the United States registry measurement without reducing correspondingly the earning capacity of the ship; and, as the United States equivalent net tonnage is reduced, the tolls collectible, limited to $1.25 per net ton, so determined, are reduced correspondingly. In the fiscal year 1917, the first for which record has been kept of the aggregate United States equivalent net tonnage of vessels transiting the Canal, such tonnage for the 1,803 commercial transits totaled 4,702,063 tons. The net tonnage for the same vessels as measured under the Panama Canal rules totaled 5,798,557 tons. The United States equivalent net tonnage was accordingly 81.09 percent of the Panama Canal measure-

ment. In such proportion, if we assume a vessel of 10,000 net tons, Canal measurement, the United States registry net would be 8,109 tons; or, to draw nearer to practical comparisons with average actual ships, a ship of 5,000 net tons, Canal measurement, would be of 4,055 tons as measured under registry rules. On the original Panama Canal basis, tolls for the transit of a 5,000 net ton ship would have been $1.20 times the net tonnage, or $6,000. With the limitation that the tolls may not exceed $1.25 times the registry tonnage as determined under United States rules, the tolls collected would be $1.25 times 4,055 or $5,068.75. The tolls were therefore reduced by $931.25 and amounted to slightly over $1 per Canal net ton.

In the course of the effort to have the Panama Canal rules adopted as the sole basis of measurement, the Canal administration has proposed that a rate of $1 per Canal net ton be established for laden ships, 60 cents for ships in ballast. On such basis the laden ship of 5,000 net tons would pay $5,000. In the ratio of Canal net to registry net in 1917 this would have been slightly less than the equivalent of $1.25 times the United States registry net measurement.

Through the years since 1917 the net tonnage as measured under United States registry rules has been reduced, by virtue of various rulings of the Commissioner of Navigation and by changes in ships' structures to take advantage of the rulings, but the Panama Canal net measurement, which determines interior carrying capacity, has not decreased. The percentage which the aggregate United States registry measurement net tonnage has formed of the Panama Canal net tonnage of transiting vessels in the fiscal years from 1917 to 1933, inclusive, is as follows:

Fiscal year—	*Percentage*	Fiscal year—	*Percentage*
1917	81. 09	1926	78. 52
1918	80. 55	1927	78. 41
1919	84. 80	1928	77. 61
1920	82. 95	1929	76. 39
1921	81. 85	1930	75. 66
1922	80. 59	1931	74. 10
1923	80. 44	1932	72. 84
1924	80. 15	1933	71. 72
1925	79. 33		

Reverting to the 5,000-ton ship, measured under the Panama Canal rules, which are constant, in 1933 its net tonnage as measured under the United States registry rules would be only 3,586 tons, or 71.72 percent as great as its Canal net. Tolls, instead of being $6,000 as originally intended, or $5,000 on the proposed basis of $1 per Canal net ton, or $5,068.75 on the basis of the United States registry measurements as in 1917, would be $1.25 times 3,586, or $4,482.50. In other words, on this hypothetical representative ship the actual tolls charges under the dual system decreased by $586.25 between

1917 and 1933, or 11.57 percent, due simply to changes and adjustments under the registry rules and not to any change in rates or in the earning capacity of the ship.

The above table of percentages indicates a continued downward trend. There is no definite limit to the decline under present law. The revenues of present law and the revenues of the Canal are at the mercy of the officials who establish and interpret the rules for measurement for registry in the United States.

The peculiar effects of the United States registry rules of measurement on the net tonnage of vessels, hence on Panama Canal tolls, are illustrated by the case of the passenger liner *Empress of Britain*, a large steamer which has made several cruises around the world, passing through the Suez and Panama Canals. Her net tonnage as measured under the Suez rules is 26,531 tons and for transit through the Suez Canal she pays $30,741, plus any charge for individual passengers. The net tonnage of this vessel under Panama Canal rules is 27,503 tons. Her net tonnage under British registry rules is 22,545 tons. Under United States registry rules in effect at the time of the latest transit of the *Empress of Britain* through the Panama Canal her net tonnage measured 15,153 tons, and tolls paid, at $1.25 per ton, were $18,941.25. The United States registry rules set the net tonnage at more than 7,000 tons less than the British registry measurement, and the tolls paid for passage through the Panama Canal were approximately $11,800 less than the amount paid at Suez.

The main reason for the difference between British and United States registry measurements was the exemption of certain so-called cabin spaces under the United States rules. One entire upper deck of the vessel is devoted to lounges, libraries, social halls, smoking rooms, etc., which under the British rules (and the Suez and Panama Canal rules) are subject to measurement and inclusion in the net tonnage. There was no stateroom on the deck. Taking advantage of an American ruling relative to such spaces in relation to staterooms, the owners removed from a small cloak and check room the original equipment and installed a bed, chiffonier, and portable washstand, and called it "Apartment A." This secured the exemption of space amounting to 3,319 tons from inclusion in the net tonnage as determined under United States registry rules, in addition to 4,181 tons exempted in other passenger spaces under United States rules but not under British or Canal rules. The result is in effect a gift to the steamship company from the United States Government of approximately $9,000 through this one feature alone; as stated, the Panama Canal tolls were less than those at Suez by about $11,800.

The case of the *Empress of Britain* is notable because of the size of the vessel and the amounts concerned but is fairly representative of the principles involved.

Remedy.—Insofar as the necessity of measuring vessels under two kinds of rules is concerned, this could be terminated by action of the President, who might order that the tolls be levied on the basis of net tonnage as determined under the rules of measurement for registry in the United States. This, however, would make things worse by subjecting the Canal tolls collection completely to the vagaries of the registry measurements. It would abandon entirely the scientific, equitable, and stable Canal measurement and substitute a system not designed as a basis of levying tolls for cargo-carrying capacity, variable according to minor conditions not affecting capacity, and subject to changes in accordance with rulings of the Commissioner of Navigation.

The remedy needed is to get back to the Panama Canal rules of measurement as a basis and to use them uniformly, applying such rates as may be prescribed by Congress and the President.

Rates proposed.—As stated, the Canal administration has proposed the adoption of rates of $1 per net ton for laden ships and 60 cents per net ton for ships in ballast, on the basis of Canal measurement. When the suggestion was originally made the proposed basis would have caused the collection of tolls approximately equal to those then being collected under the dual system. However, with the decline in registry net tonnage as measured under the changing United States rules, the proposed figures would now occasion a moderate increase on laden vessels generally, with a decrease in charges on ballast ships; and the tendency to an increase as the result of applying the Canal rules will grow as the amounts collected under the present basis continue to decrease. Opposition to remedial legislation has grown stronger as certain shipping companies have benefited more and more by the workings of the present system.

Equity of proposed tolls.—Tolls on the basis proposed by the Panama Canal, of $1 per Canal net ton for laden vessels and 60 cents per ton for vessels in ballast, would be approximately the same as the present Suez Canal rates for vessels in ballast and about 14 percent lower than Suez charges for laden ships. However, the law now proposed would allow the President discretion to adjust the rates between $1.20 and $0.75 per net ton, Panama Canal measurement, for laden vessels, the ballast rate to be 60 percent of the laden rate. It would extend to him the same discretion intended by the Panama Canal Act but would keep the tolls on the definite, scientific, and equitable basis of the Canal rules of measurement, accurately and fairly related to earning capacity. The President might set the rate above or below $1 per ton, as is justified in his judgment. The main point would be that an equitable and uniform basis would be in effect and the charges for transit through the Canal would be fairly related to the earning capacity of the ship, and the revenues of the Government

from its service to shipping would be what the Government intends them to be.

Confronted with the adoption of the Canal basis only for tolls collection, some American steamship owners have proposed that the rate to be adopted for laden ships be 80 cents per Canal net ton, and have also proposed as a general basis that no rate should be adopted which would increase the charges on any American ship. The first proposal would set a rate too low, as judged by the service rendered to the ships, the cost of building and operating the Canal, and comparison with other Canal rates and rates for land transportation. The second proposal seems completely unreasonable, not only because of the elements cited with respect to the first proposal but because it would demoralize tolls and revenues in order not to deprive a few ships of special benefits to which they are not in equity entitled. It would be a case of making great sacrifices to protect the beneficiaries of an abuse.

The justice of charging tolls at essentially the level of $1 per ton for laden ships is well established and is not opposed except by individuals or organizations which desire individually to benefit through reduction of charges. In this connection it is sometimes claimed that a reduction in tolls rates would be an aid to American shipping. That this is a dangerous conclusion to jump at appears from the following brief facts. In the fiscal year 1933, tolls paid by foreign ships were 54 percent of the total tolls, those by United States ships in the intercoastal trade 34 percent, and those by United States ships in foreign trade 12 percent. A lowering of Canal tolls below the value of the service rendered should be considered in the nature of a subsidy to shipping. On the basis of the traffic of the past year, each million dollars of tolls reduction would represent a subsidy of $540,000 to foreign shipping, of $340,000 to United States shipping not in competition with foreign shipping, and of $120,000 to those ships of the United States which are in competition with foreign flags. It is thus seen that, as far as United States shipping is concerned, the greatest reduction would be to vessels engaged in the intercoastal trade of the United States. These vessels are protected against the competition of foreign lines and their competition is with the land transportation systems in the United States. Expenses of operation and maintenance of the Canal will increase on account of the necessity of replacements and betterments. It appears in line with sound business practice not to lower the rates of tolls below the present levels, or approximately the proposed rates on the Canal measurement basis. On the contrary, the situation by which the Government is being deprived of legitimate revenue through the workings of the

dual measurement system calls for relief to end this unwarranted loss and at the same time to establish the levy of tolls on an equitable basis.

GENERAL PROGRAM OF PLANT IMPROVEMENT

The Canal administration prepared in 1931 a program of work to to be carried on through a 10- to 15-year period in making various betterments, enlargements, and replacements. For the more pressing needs, a 5-year program was developed, requiring a total expenditure of $15,000,000. This was exclusive of the Madden Dam construction. The decrease in national revenues resulting from the general business depression led to some deviation from the original plan for the purpose of diminishing appropriations. Accordingly, estimates under this plan submitted for the fiscal year 1933 called for appropriations totaling approximately $2,536,000. However, only $1,055,000 was actually appropriated for this work during the fiscal year 1933.

WORK IN FISCAL YEAR 1933

Appropriations made for the fiscal year 1933, exclusive of the $1,000,000 appropriated for continuation of work on the Madden Dam, included: $250,000 for the replacement of old frame quarters for gold employees; $400,000 for enlarging the present drydock at Cristobal; $50,000 for the construction of a home for superannuated alien employees at Corozal; $66,000 for beginning Corundu fill; $25,000 for new roads in Corozal Cemetery; $80,000 for widening Balboa and La Boca roads from the Canal Zone-Panama boundary to the East Ferry Landing, Thatcher Highway, La Boca; and $184,000 for grading of building sites.

The program for which these amounts were appropriated was completed during the past fiscal year, with the exception of the home for superannuated alien employees, which has been held in abeyance because the Government of Panama has taken over the care of its insane and this may necessitate some change in plans

WORK IN FISCAL YEAR 1934

For the fiscal year 1934, amounts for various improvements were included in the budget and appropriated by Congress. Prior to the beginning of the year, however, the President directed that substantial economies be effected in the regular appropriations by not withdrawing all of the appropriated amounts from the Treasury. As a result, these projects were suspended temporarily. Subsequently, they were included in the list of public works submitted by the Canal administration to the Federal Employment Stabilization Board, in which list were projects totaling in cost $2,000,000. The amount allotted to the Canal by the National Industrial Recovery Administration was $1,000,000, and that amount is to be expended during the fiscal year 1934 on the following works.

Concrete wharf at Cristobal Drydock.—This is to be a mooring and repair wharf, 40 feet wide, at the entrance to the drydock and adjoining the shops and will replace the present old wooden wharf, which is unfit for further use. The amount of $350,000 made available for 1934 for this structure will build the eastern half, 400 feet long, next the drydock entrance, leaving the other half of the 800-foot wharf planned originally to be built later.

This will be a concrete wharf on caissons. Some of the caissons will be built in the dry behind the cofferdam placed in connection with the reconstruction of the drydock.

Dock 14, Cristobal.—This is to be a timber wharf, 290 feet long, on the north side of the entrance to the Cristobal Drydock and adjoining the north wall thereof, and will cost approximately $25,000. It is probable that in the future there will be an extension of this wharf of approximately 400 feet. Whether this extension will be of timber or concrete has not yet been decided, but the depth to bed rock is so great that it will probably be supported on piles and not on caissons. This dock will be a part of the Cristobal plant of the mechanical division.

Balboa high school and junior college.—The need for this construction was explained in the annual reports for 1931 and 1932. The group will consist of 3 or 4 structures, depending on the design and the cost is estimated at $1,250,000. The sum of $300,000 was allotted for the fiscal year 1934 and is to be used to build one of the buildings of the group.

Quarters for American employees.—The sum of $175,000 was allotted for replacement of old quarters and will provide quarters for 32 families. These will be constructed in Ancon for physicians connected with Gorgas Hospital and will allow the removal of some old buildings erected by the French, and in Gatun where many of the quarters used from early construction years need to be replaced.

This work is part of an extensive program of replacement made necessary by the deterioration of old quarters to a state in which maintenance has become excessively expensive. After 1916 no appropriations were secured until the fiscal year 1927 when $384,278 was allotted; in 1928 the appropriation was $499,943; in 1929 and 1930 it was $400,000 each year. For 1931 and 1932 no appropriation was made; instead, it was suggested by the Congressional committee that expenditures for this purpose be made from the surplus and reserve funds of the Panama Railroad Co. and, accordingly, $400,000 was so withdrawn and expended for gold quarters in each of the 2 years. For 1933, $250,000 was appropriated by Congress. The program outlined by the Canal administration calls for $500,000 for replacement of old quarters each year although $600,000 or $700,000 annually would produce greater economy in the end. At $500,000 per year it will take about 24 years to replace the present old quarters.

Dredging division station at Gamboa.—With an allotment of $50,000 a basin will be dredged on the east side of the Canal at Gamboa, adjoining the barge repair station, and the spoil will be used in land reclamation. Some of the dredging division plant will be kept there and some of its activities will be based on that station. A plan is being considered of placing the main dredging station at Gamboa so that slides may not occur between that station and the dumping grounds in Gatun Lake and so that equipment not working in Gaillard Cut need not be moored in the Cut but will be out of the way of traffic, but the extent to which this will be developed is for further consideration.

Dump barge.—A dump barge of 1,000 cubic yards capacity is to be constructed at a cost of $100,000. This will give the dredging division an additional barge for the transportation of dredged spoil to the dumps.

ADDITIONAL NEEDS

As stated above, lists have been prepared of needed additions and replacements over a period of years and approximate estimates have been made of the costs. Obtaining funds for this work is one of the most important problems of the Panama Canal. For the construction of the Canal and its many auxiliaries temporary, inexpensive wooden structures were built to house the shops and other parts of the construction plant, the employees and many of the public utility and governmental functions, and many of these continued to be used in the interest of economy for housing the operating plant and personnel after construction was completed. Because of the destructive effects of the elements and of the insects in this location, the economical life of such structures is relatively short. The plan is to replace these with structures of longer life, and at the same time increase their capacity where justified, as funds are obtained. The undertaking is so extensive that many of these old structures are being maintained at excessive cost, and this uneconomical procedure will continue and become worse at an increased rate unless funds for the purpose can be made available at an increased rate for the next 5 or 10 years.

In this construction work, the labor problems are greatly simplified if the funds can be obtained with such regularity as to create a fairly uniform demand for labor.

UNEMPLOYMENT

The allotments by the industrial recovery administration for the fiscal year 1934 have the dual advantage of constructing needed public works and making work available for the unemployed. The two have fitted together excellently as all of the work for which funds were allotted is of immediate need and permanent use.

The situation with respect to unemployment among aliens on the Isthmus has been explained earlier in this section, in connection with the proposal that an appropriation be made for the repatriation of former employees and members of their families. Such repatriation is a tangible form of partial relief which would at the same time relieve a grievance on the part of Panama, and therefore an endeavor to accomplish something along these lines is recommended strongly. However, as stated before, this section (the Canal Zone and the terminal cities of Panama and Colon) is faced by a condition of permanent unemployment for both Americans and aliens because the natural increase in population is in excess of labor requirements. In this situation the Governor of the Panama Canal cannot recommend a continued make-work program. There would be no end to it. The best that the Canal can do is so to plan its improvement work as to give continuous employment and thus avoid the disadvantages which are inherent in intermittent demand for labor.

BUREAU OF EFFICIENCY

Upon recommendation of the Governor, the Acting Secretary of War under date of October 6, 1931, requested the chief of the bureau of efficiency to arrange, if possible, for a visit to the Canal Zone for the purpose of making a general survey of Canal operations and administration. This survey was requested in order that both the President and Congress, in passing upon matters affecting Canal operation and administration, might have an authoritative report and recommendations on a number of important matters now pending from an independent bureau of the Government.

In conformity with the Acting Secretary of War's request, four employees of the bureau of efficiency arrived on the Isthmus on February 24, 1932, and were engaged on the Isthmus until October 23, 1932, in studying the general business administration of the Canal, including a number of matters specifically referred to them by the Governor. No limitations were imposed upon the extent of their investigations, and every facility was extended to assist them in obtaining a comprehensive grasp of Canal operations and the administrative problems incidental to such operations.

Prior to the end of the fiscal year several reports and recommendations were made by the bureau to the Secretary of War on a few of the subjects investigated and forwarded to the Governor for his information and such further investigation or action as the nature of the report might warrant. Studies necessitated thereby were under way at the end of the year. Because of the discontinuance of the bureau of efficiency, no further reports are expected as a result of the investigations made. Studies to accomplish the same purpose are now being carried on under the engineer of maintenance of the Panama Canal.

SECTION IV

GOVERNMENT

The civil government of the Canal Zone is conducted as prescribed in the Panama Canal Act of August 24, 1912, and other acts and Executive orders made applicable to the Canal Zone. Whenever it has been practicable to assign governmental functions to departments in the organization established for the operation and maintenance of the Canal, this has been done. Complete cooperation and greater economy and efficiency are derived from such coordination of functions.

Data on the expenses and revenues of various features of the Canal operation and government are shown in the financial and statistical statements in section V.

AREA OF THE CANAL ZONE

The total area of the Canal Zone, and the areas segregated for various purposes, as of July 1, 1933, are shown herewith:

		Square miles
Total area of the Canal Zone		552. 8
Land area, Canal Zone	361. 7	
Water area, Canal Zone (inclusive of Madden Lake to +260-foot contour)	191. 1	
		55. 28
Land areas, military and naval reservations (inclusive of revocable license areas):		
Military reservations	47. 02	
Naval reservations	5. 86	
		52. 88
Land areas, Canal Zone town sites (exclusive of Army and Navy posts)		12. 06
Barro Colorado Island		5. 71
Forest reserve		5. 47
Farms, cattle pastures		77. 70
Target ranges: Revocable license to U.S. Army, west side of Canal; does not include ranges in military reservations		5. 60
Land areas, not used for any purpose		202. 28

POPULATION

A house-to-house canvass of the civil population of the Canal Zone including civilian employees of the Army and members of families of

Army and Navy personnel but omitting commissioned, warrant, and enlisted personnel, was made by the police force during the month of June 1933. A summary is presented below:

District	Americans			All others			Total
	Men	Women	Children	Men	Women	Children	
Balboa	2,268	2,312	2,072	4,568	2,713	5,566	19,529
Cristobal	472	682	807	3,458	2,090	4,694	12,203
Prisoners	11			94	2		107
Total	2,781	2,994	2,879	8,120	4,805	10,260	31,839

The foregoing total indicates an increase of 859 over the 30,980 reported in June 1932.

In addition to the civilian population listed above, the military and naval forces in the Canal Zone in June 1933 numbered 11,012 (Army, 9,706; Navy, 1,306), making a total population of 42,851. The corresponding figure as of June 30, 1932, was 42,070, of whom 11,090 were in the Army and Navy. For the 5 years preceding 1932 the totals were: 1927, 36,600; 1928, 37,512; 1929, 39,137; 1930 (national census), 39,467; and 1931, 40,565.

Of the 31,839 civil population in June 1933 a total of 7,346 were employed by the Panama Canal and Panama Railroad Co.; of these 2,275 were Americans and 5,071 were aliens. Approximately 750 American and 4,500 alien employees were living outside of the Canal Zone.

PUBLIC HEALTH

The general health conditions of the populations of the Canal Zone and the two terminal cities of Panama and Colon, for the past year have been good, although there was some increase of charity cases in the hospitals and of diseases caused or aggravated by undernourishment due to lack of employment. No epidemics of diseases have occurred. Public health is discussed in greater detail in the annual reports of the health department for calendar years, which are issued as separate publications, and most of the tables presented in the following paragraphs refer to calendar years.

VITAL STATISTICS

The morbidity and mortality rates from diseases and injuries, and other vital statistics covering the populations of the Canal Zone and the cities of Panama and Colon, are set forth in detail in the calendar year annual report of the health department, which is published yearly in pamphlet form. For this reason some of the tables are omitted from this report and the discussion of vital statistics is limited

to a brief résumé of the general death rate, death rates from disease alone, birth rates, and infant-mortality rates.

General death rate.—Total death rates for the Canal Zone population and the residents of Panama City and Colon for the past 5 calendar years have been as follows:

	Annual death rates per 1,000 population				
	1928	1929	1930	1931	1932
Canal Zone (employees and nonemployees)	8.53	7.67	7.14	7.52	7.30
Panama City	20.06	19.36	17.57	17.64	15.90
Colon	14.73	16.48	17.40	16.07	14.43

It will be noted that the total death rate for the Canal Zone is slightly higher than for the year 1930, which was the lowest attained since construction of the Canal was undertaken in 1904. The rate for Panama City was the lowest ever recorded, and Colon had the lowest rate since 1927, showing a decrease of 1.64 from the rate of 1931.

Death rates from disease alone.—For the past 5 years death rates from disease alone for the Canal Zone, Panama City, and Colon have been as follows:

	Annual death rates per 1,000 population				
	1928	1929	1930	1931	1932
Canal Zone	7.37	6.77	6.13	6.09	6.47
Panama City	19.44	18.77	16.81	16.76	15.11
Colon	14.20	15.64	16.46	15.23	13.50

The death rates from disease alone for the Canal Zone showed a slight increase over 1931, which was the lowest per 1,000 population since construction was begun under American control. Death rates for Panama City were the lowest on record. Colon showed the lowest death rates for disease alone during the last 5-year period.

Since the stabilization of the population resident in the Canal Zone, beginning about 1912, there has been a gradual decrease both in total death rates and those from disease, as is indicated in the following table, showing average rates per 1,000 of population by 5-year periods:

	1912–16	1917–21	1922–26	1927–31
Death rates (total)	14.54	8.47	8.29	7.78
Death rates (disease only)	12.60	7.07	7.16	6.69

Birth rates, including stillborn.—Birth rates for the past 5 calendar years, including stillborn, have been as follows:

	Birth rates per 1,000 population				
	1928	1929	1930	1931	1932
Canal Zone	14.84	13.85	13.28	12.69	11.69
Panama City	36.06	34.48	37.09	33.25	32.32
Colon	26.70	29.01	30.64	30.63	30.77

The birth rate continued the decline which has been shown each year, since 1924, when it was 21.65 per 1,000 population. The rate for Panama City showed a further progressive decrease from previous years and is the lowest on record with the single exception of that for the year 1926. The general trend in birth rates for Colon shows a slight increase during the 5-year period 1928–32.

Birth rates in the population of the Canal Zone have been gradually decreasing during the past 15 years as indicated in the following table, showing birth rates by 5-year periods, segregated by color:

	1918–22		1923–27		1928–32	
	White	Colored	White	Colored	White	Colored
Total birth rate per 1,000 population	16.91	30.41	13.36	23.42	9.71	16.04
Live birth rate per 1,000 population	16.37	28.65	12.89	22.01	9.39	14.96
Stillbirth rate per 1,000 population	.54	1.76	.47	1.41	.32	1.08

The birth rate for total population for 1932 (11.69 per 1,000 population) is the lowest of record.

Death rates among children under 1 year of age.—One criterion for measurement of the progress being made in public-health procedure is the comparison from year to year of infant mortality rates. For 1932, in the Canal Zone, the infant mortality rate per thousand births for white Americans was 20, and for colored 93, making a combined rate of 71, which combined rate was the same as for 1931, and the lowest of record. Great success has been attained in reducing these rates in Panama City and Colon as is evidenced by the fact that in 1917 infant mortality rates in Panama City were 259 and in Colon 249, whereas in 1932 they were 129 and 69, respectively. Colon showed the lowest infant mortality rates of record.

The following table shows infant mortality rates, by 5-year periods, from 1918 to 1932, inclusive:

Deaths of infants under 1 year per 1,000 births

	1918–22	1923–27	1928–32
Canal Zone	96.08	88.87	86.97
Panama City	162.28	131.68	136.32
Colon	153.81	116.95	100.97

The following table shows infant mortality rates, by calendar years, from 1928 to 1932, inclusive:

Deaths of infants under 1 year per 1,000 births

	1928	1929	1930	1931	1932
Canal Zone	115	94	81	71	71
Panama City	148	142	121	142	129
Colon	104	116	108	109	69

Principal causes of death.—Tuberculosis and pneumonia take the greatest toll of life in the population of the Canal Zone, and affect the colored population to a much greater extent than the white. The deaths from diseases of the chronic degenerative type, such as nephritis, cancer, and organic diseases of the heart, are being observed with increasing frequency. It is of special interest to note that deaths from diseases of the arterial system and from apoplexy have occurred with such frequency during the past two years as to be included among the six most frequent causes of death. Tuberculosis and the pneumonias likewise continue to be the leading causes of death in both Panama City and Colon and the death rates from these two diseases are much higher in those cities than in the Canal Zone.

MALARIA

The situation in 1932 with respect to malaria was considerably better than in the three preceding years, notwithstanding the fact that large parties of employees were still engaged on field projects beyond the limits of the areas in which mosquito-control work is done as a matter of routine, and that with the opening of good highways into the interior of the Republic of Panama increasingly larger numbers of Canal Zone employees are visiting points in the provincial districts beyond the so-called sanitated areas.

The malaria rates per 1,000 employees during the past 10 calendar years have been as follows:

1923	19	1928	14
1924	16	1929	21
1925	27	1930	26
1926	14	1931	19
1927	11	1932	14

Observations made in this area over a period of many years indicate that, for reasons as yet not definitely determined, malaria prevails to a greater extent during certain years than others, with an occasional year during which the rate is extraordinarily low.

During 1930 malaria prevailed to a greater extent than usual. Information available indicates that this was true not only for the

Canal Zone, but also throughout the Republic of Panama. During that year the rate for employees was 26 per 1,000 of strength (cases of malaria 410, average number of employees 15,524).

In 1931 the rate for employees decreased to 19 (cases 276, average strength 14,597), and in 1932 decreased still further to 14 (cases 177, average strength 12,621).

The cumulative rates of malarial infection for employees for the first 6 months (January–June) of each year, for the past 6 years, have been as follows:

	1928	1929	1930	1931	1932	1933
Malaria in employees (absolute numbers)	94	177	226	152	76	262
Average number of employees, January–June	14,159	16,491	16,273	15,398	13,111	15,351
Rate per 1,000 per annum	13.3	21.5	27.8	19.7	11.5	30.3

Observations of records in this area suggest that malaria has cycles of high and low prevalence as do other diseases. Various factors interact to bring about these cycles of high and low prevalence; variation in number of human carriers of malarial parasites, in numbers of infected mosquitoes capable of transmitting the parasite, and in natural seasonal conditions which may, during certain years, promote the breeding of *Anopheles* mosquitoes in immense numbers and during other seasons adversely affect breeding, thereby greatly reducing the density of the mosquito population. It is noted, therefore, that while the malarial rates for the first six months' period of 1931 and 1932 showed a tendency toward decrease over 1930, the rates for the same period of 1933 were noticeably higher and more analagous to those for 1930. Data obtained through a comprehensive study of the seasonal density of *Anopheles* mosquitoes and the fluctuations from year to year in malaria rates indicate that the unusually high malaria rate during the first half of 1933 may have been due largely to the fact that during April, May, and June of this year Gatun Lake receded to one of the lowest levels of record and maintained this low level for an unusually long period of time, with the result that large areas of *Chara* and bladderwort (*Utricularia mixta*) emerged and formed mat-like patches on the surface, thus producing ideal breeding conditions for the *Anopheles* mosquito. The dispersal flights of *Anopheles albimanus* (the malaria-transmitting mosquito of the Isthmus) have been unusually large this year and there appears to be no doubt that their source was the Gatun Lake area. The work of malaria control, including dusting of mosquito breeding areas with paris green by airplanes, was continued during the fiscal year 1933.

HOSPITALS AND DISPENSARIES

The hospitals, dispensaries, and other health department installations have been kept in good physical condition during the year. The total number of patient days at the various institutions increased about 9 percent over the previous fiscal year, mostly due to the increased number of patients treated at Corozal Hospital. The total number of patient days at each institution for the last two fiscal years are shown in the following tabulation:

	1932	1933
Gorgas Hospital	156,664	151,522
Corozal Hospital:		
Insane	238,688	269,130
Cripples and chronic medical and surgical cases	30,338	32,609
Colon Hospital	38,283	34,981
Palo Seco Leper Colony	38,772	39,002
Total	502,745	527,244

Transfer of insane patients from Corozal Hospital.—During the month of June 1933, in accordance with arrangements made with the Panamanian Government, that Government began the transfer of approximately 600 insane patients which were formerly cared for by Corozal Hospital at the expense of the Republic of Panama, to the newly completed Matias Hernandez Asylum in the Republic, where they will be cared for in the future. Arrangements were made for completing the transfer by the middle of July 1933.

SMALLPOX VACCINATION

General vaccination of the populations of the Canal Zone and of the cities of Panama and Colon was performed during the fiscal year 1933, the last previous general vaccination for smallpox having been undertaken during 1929. A total of 41,338 individuals was vaccinated during the year.

GARBAGE DISPOSAL, PACIFIC TERMINUS

Disposal of garbage for the Pacific side was transferred to the new incinerator near Summit on April 10, 1933, where the problems of handling and burning of garbage are being solved in a satisfactory manner.

QUARANTINE AND IMMIGRATION SERVICE

In spite of the world-wide depression in shipping, there was no considerable decrease in the work of the quarantine division during the year. Inspection was made of a total of 5,258 vessels and 460 airplanes as compared with 5,433 vessels and 347 airplanes during the

preceding year. Data reported for the quarantine service are for fiscal years, July 1 to June 30.

The established practice of expeditious and efficient quarantine procedure was maintained by this division. It was not necessary to detain any vessels on account of the presence of a quarantinable disease on board at time of arrival.

As has been the case since the opening of the Canal to traffic, particular attention has been directed against the possible introduction of plague into the Canal Zone.

Immigration matters (except Chinese) are handled by the quarantine division for both the Canal Zone and the Republic of Panama. During the year 59 persons who were detained or investigated were subsequently permitted to enter, while 954 were deported under provisions of the immigration laws.

The activities of the quarantine division during the fiscal year 1933 are summarized as follows:

Vessels inspected and passed	3, 272
Vessels granted pratique by radio	99
Vessels passed on certificates of masters	1, 887
Total	5, 258
Crew inspected and passed	13, 335
Crew passed by radio	22, 327
Crew passed on certificate of masters	302, 617
Passengers inspected and passed	74, 223
Passengers passed by radio	4, 639
Passengers passed on certificate of masters	41, 721
Total	458, 862
Airplanes inspected and passed	460
Crew of airplanes inspected and passed	1, 447
Passengers of airplanes inspected and passed	1, 688
Total	3, 135
Persons admitted to station account immigration laws	1, 057
Number of detention-days per year	6, 007
Persons held or detained for investigation and released	59
Persons deported under immigration laws	954
Supplementary inspection of vessels	3, 275
Vessels fumigated	42
Box cars fumigated	109
Revenues:	
Subsistence	$9, 066. 80
Night boarding	6, 080. 00
Fumigation	2, 009. 00
Deratization inspection	205. 00
Total	17, 360. 80

Rations issued:	
Cabin passengers	453
Steerage passengers	5, 557
Gold employees	437
Silver employees	5, 379
Total	11, 826

MUNICIPAL ENGINEERING

Municipal work carried on during the year included the construction and maintenance of roads, streets, and sidewalks, and maintenance and operation of water and sewer systems, etc. Various construction jobs were performed for the departments and divisions of the Panama Canal, the Army and Navy, and the Republic of Panama, and for individuals and companies.

WATER SUPPLY

The second of the two 1,000,000-gallon steel water tanks, referred to in the Annual Reports for 1931 and 1932, was placed in service at the Cristobal-Colon terminal during the year. The installation of these two tanks provides a reserve water supply of 2,000,000 gallons. The daily water consumption of the population served by this system is between five and six million gallons.

A number of water-line extensions and improvements were made during the year, notably the installation of a 6-inch cast-iron water line between the existing 12-inch water line on the west bank of the Canal immediately adjacent to the Thatcher Highway terminus and Fort Kobbe, with a 3-inch galvanized iron branch leading to Palo Seco and serving the leper colony and Army activities at Fort Kobbe; a branch line to Farfan Beach; connection with the Panama City water system with new reservoirs at Engineers Hill; installation of 30-inch cast-iron pipe emergency connection from the Canal at Paraiso to the existing Gamboa main; and the installation of cross connection in the main lines at Corozal for the purpose of reducing the water pressure.

Consumption of water for municipal uses during the past 3 years has been as follows:

	1931	1932	1933
	Gallons	*Gallons*	*Gallons*
Canal Zone	3, 194, 899, 462	3, 158, 818, 190	3, 334, 065, 110
City of Panama	1, 569, 433, 000	1, 503, 511, 000	1, 485, 666, 000
City of Colon	848, 412, 250	727, 158, 000	759, 279, 000
Sales to ships	172, 248, 037	157, 333, 310	155, 756, 390
Total	5, 784, 992, 749	5, 546, 820, 500	5, 734, 766, 500

The quantity of water pumped at each of the pumping stations during the year, the average pumped per month, and the average cost of pumping per 1,000 gallons are shown in the following tabulation:

Pumping station	Total gallons pumped during year	Average gallons per month	Average cost per 1,000 gallons for pumping
Gamboa, U.S. No. 1	3,487,968,000	290,664,000	$0.0237
Miraflores, U.S. No. 2	484,640,000	40,387,000	.0258
Balboa, U.S. No. 3	2,588,804,000	215,733,000	.0191
Miraflores Lake, No. 4 (partial—1 month)	5,216,000		
Paraiso	79,263,000	6,605,000	.0442
Mount Hope	1,863,771,000	155,314,250	.0209029
Agua Clara	376,734,000	31,394,500	.0623663
Monte Lirio (Gatun)	1,246,000	103,833	.7710685
Frijoles	5,047,500	420,625	.2484200
Total	8,892,689,500	745,838,238	

The usual maintenance work was performed on pipe lines, water mains, reservoirs, filtration plants, and pumping stations during the year. All pumps are electrically driven except those at Frijoles and Monte Lirio, which are driven by gasoline engines; auxiliary windmills are also installed at Monte Lirio and Frijoles and operate whenever there is sufficient wind movement.

SEWER SYSTEMS

The usual maintenance work was performed during the year on the sewer systems, and in addition the following improvements were made: Installation of sewer system for five new houses at Gorgas Hospital, extension of main Balboa box sewer at entrance to sea, and renewal of storm sewer crossing Ancon Boulevard, Balboa, near house 608.

ROAD CONSTRUCTION

Thatcher Highway.—Work on the new Thatcher Highway and construction of the ferry approaches and slips was completed and the highway and ferry were opened to traffic on September 1, 1932. The highway, which was described in the report for 1931 and more briefly in that for 1932, is a reinforced concrete roadway, 18 feet in width and 6.73 miles in length from the west bank of the Canal at Balboa to the boundary with Panama, near Arraijan, where it connects with the highway system of Panama. It effects a saving of about 5 miles from the distance to interior points by way of Pedro Miguel and Paja and affords passage by wider roadway with less curvature.

Balboa and La Boca Roads.—These roads, which carry the bulk of traffic between Panama City going to interior points and of Panama on the west side of the Canal via the new Thatcher Highway and are also main arteries for Canal Zone vehicles, were found to be inadequate

to accommodate this volume of traffic. Accordingly these roads were increased in width from 20 to 30 feet and the adjacent sidewalks were reconstructed during the year. Water and sewer lines were relocated as necessary.

Bolivar Highway.—This highway extends between Cristobal and Gatun, about 6¾ miles, and is built in considerable part on clay fills through a swampy area. Its concrete surface slab does not find even support on these fills, which are saturated in the rainy season and shrink in the dry season, with the result that the slab is being constantly broken by the heavy truck traffic from Fort Davis. It is proposed to reconstruct it by laying a new concrete slab over the old one as a base as funds can be secured. About 2,800 of the 35,000 linear feet were so reconstructed from maintenance allotments at the end of the fiscal year 1932, and in the past year considerable work was performed in rebuilding the worst sections and in relocating a short section near Mount Hope, as well as providing considerable drainage in connection with the preservation of the road.

A considerable number of street paving and widening projects were completed during the year, including the following: Concreting Gaillard Highway between Corundu and Maria Sala bridges; repaving and widening of Coconut Alley, Cristobal; and the widening of the road leading from Fort Amador to the quarantine reservation.

Additional parking spaces were constructed to take care of the parking needs of the increasing number of automobiles on the Canal Zone, as follows: 3,000 square yards of gravel and asphalt parking space adjacent to the commissary, stadium, dispensary, and clubhouse at Balboa; and concrete extension of parking space adjacent to the Administration Building at Balboa Heights.

With the direct aim of relieving the unemployment situation as much as practicable, a program involving the expenditure of approximately $184,000 was inaugurated and carried on during the year. In order to provide for the employment of a maximum number of men, this work was planned and carried out by the use of a minimum of mechanical equipment and a maximum of labor. For the most part the work performed consisted of necessary filling and grading preparatory to new building construction, and extending and widening of roads, as well as the construction of dikes for fire protection.

CRISTOBAL DRYDOCK

The drydock at Cristobal was closed on December 13, 1932, for the beginning of actual work on its enlargement. The old drydock had been built by the first French canal company in 1886 and had usable length of 190 feet and width of 32 feet with about 15 feet of water over the sills at high tide. It was enlarged in 1907 and 1908 to

300 feet in length, with the same width and depth, which was considered 13½ feet over the sill and keel blocks at mean tide. Under the present enlargement it is to have length of 381 feet from the head to the inside of sill along the center line; width of entrance at top, 66 feet; width of dock at top, 80 feet; and at bottom, 65 feet; with 3 altars on each side, each 2 feet 6 inches wide; elevation at top of dock, 7 feet above sea level; elevation of bottom of dock, 25 feet below sea level; of sill, 22 feet; and of keel blocks 21 feet below mean sea level. Allowing 15 feet off the dock length for working around a ship and 2 feet off the entrance width, the new dock will take vessels 366 feet long or more, up to 64 feet beam and drawing nearly 21 feet of water. The head of the dock is a circular segment having a radius of 40 feet.

A cofferdam was built across the entrance slip about 256 feet from the face of the proposed dock. Eight thousand five hundred linear feet of steel sheet piling of the Lackawanna type were driven as a core for the dam, a crane barge of 40 tons capacity with no. 3 double-action steam pile hammer being used. Driving was started at the center of slip and proceeded toward the south shore to permit use of the dock as long as possible.

A ¾-cubic-yard gasoline-driven shovel was installed in a borrow pit about a mile from the dock site and 32,200 cubic yards of earth were placed in the cofferdam between December 15, 1932, and February 23, 1933, using on an average of 8 trucks on two shifts of 8 hours each.

Pending completion of the cofferdam, excavation was carried on behind the old miter gates. A shaft was sunk directly behind the gates and tunnel excavation was started for the suction culvert. Neat excavation was 10 feet by 7 feet 2 inches.

Excavation in the suction tunnel was completed in February. To facilitate the placing of concrete, 8-inch cased holes were drilled from the ground surface along the centerline, on 10-foot centers, and all concrete for the culvert was poured through these holes. Concreting of this culvert was completed in April, a total of 330 cubic yards having been placed.

The natural rock surface along the north wall was such that by making a slight additional excavation, a ramp on about a 4-percent grade was secured leading from the head of the dock to the floor of the old dock just behind the gates. Four cubic-yard dump trucks were used and hauled the soil to make needed fills around buildings of the mechanical division and the supply department.

As excavation for the main walls proceeded, unsound and badly shattered rock was encountered, which made necessary the redesign of 150 feet of wall at the south side and 250 feet at the north side.

Concrete lining sections below gravity walls were thickened and reinforced, and anchors were installed to carry the horizontal thrust against the walls. The anchors consisted of heads of 70-pound rail, or 2¼-inch diameter drill rods, 24 feet long, grouted in 4-inch diameter holes drilled into rock 19 feet 3 inches on a slope.

At the west end of the north wall, high rock permitted the bottom of the wall to be established at a considerably higher elevation than shown on construction drawings. At the north retaining wall, excavation at the deepest portion of wall was carried somewhat lower than shown on construction drawings, where firm material was encountered which was considered suitable to sustain the wall load. Piles accordingly were omitted, the toe of wall being extended in order to lower the unit bearing on the foundation material.

A stratum of soft gray and red clay running diagonally across the dock site near the west end necessitated the strengthening of floor over a considerable area. This involved additional excavation to provide a reinforced slab for bridging the soft material, and the installation of special drains to carry off the water flowing in at this location.

By the end of the fiscal year excavation for the dock floor, dock walls, north retaining wall, and north side track supports was completed, a total of 38,600 cubic yards of earth and rock.

A weighing batcher which had been originally purchased for Madden Road was set up at the stock pile of the supply department in Cristobal, and charged at first with a locomotive crane and later with a ¾-cubic-yard gasoline-driven crane on caterpillar treads. Dry batches were hauled in 1½-ton trucks to a 21-cubic-foot paving mixer at the dock.

Concrete for the main walls, sill, floor, and north retaining wall was complete except 80 cubic yards over the flooding valves in the south wall. About 80 percent of the concrete in the north side track supports and 15 percent of the concrete in the south side track supports was poured by the end of the year, a total of 7,852 cubic yards.

The gate is a floating caisson type bearing against a granite block sill. A retaining wall 89 feet 6 inches long on the north side at right angles to the centerline and one 82 feet long on the south side, making an angle of 9°43′39″ with the centerline, are provided, against which the caisson may be moored when not in use.

A flooding culvert 8 feet by 4 feet 6 inches in the south wall divides into two openings, each 4 feet 6 inches by 4 feet 6 inches, at the face of the dock. A suction culvert 8 feet by 4 feet 6 inches leads from the south side of the dock approximately 161 feet to the pump house. The suction and flooding culverts join at a point 55 feet from the inside of the sill and open into two sumps in the floor, one on each side of the dock. A discharge culvert 6 feet square leads from the

pump house through the end of the south retaining wall. Keel blocks on 4-foot centers and sliding bilge blocks on 12-foot centers which may be hauled back to the wall by chain from the coping above are provided. A 5-foot gage track for a locomotive crane on the north side and a 5-foot and 16-foot gage track for a heavy crane on the south side were provided.

This project was approximately 80 percent complete at the close of the fiscal year.

PANAMA CITY AND COLON

The usual maintenance work was performed on the water and sewer systems and the streets during the year. No extensions were made in Panama. In Colon the most important jobs carried out during the year were the installation of a 10-inch sewage pump at the Colon sump, concreting of Fifth Street from Central Avenue to Melendez Avenue, concreting of Twelfth Street from Bolivar Avenue to Herrera Avenue, and the concreting of Herrera Avenue from Eleventh to Fourteenth Streets.

WATER PURIFICATION PLANTS AND TESTING LABORATORY

All water purification plants were in operation throughout the year in the purification of water used on the Canal Zone and in the cities of Panama and Colon. The testing laboratory carried on a variety of work, making a total of 6,159 tests in connection with 3,311 varied samples, including acids, alum, asphalt, cement, coal, concrete, dynamite, electrolyte for storage batteries, gas, gasoline, grease, water, kerosene, fuel and diesel oils and lubricating oils, rock, sand, soil and clay, roofing material, etc. The principal items tested were water, 2,481; concrete test cylinders, 1,108; cement, 735; and oil, fuel and diesel, 319.

FERRY SERVICE

The ferry service is operated by the dredging division and affords passage across the Canal at the Pacific end for vehicles, foot passengers, and led animals. The service was operated at the north end of Pedro Miguel Locks during July and August 1932, continuously on routine daily schedule, including Sundays and holidays, with the exception of July 22, when an accident to the ferryboat *Presidente Amador* caused the canceling of two round trips.

The ferry service was transferred from Pedro Miguel to the Pacific entrance on Setpember 1, 1932, this new service connecting La Boca on the east bank of the Canal with the Thatcher Highway on the west bank. A schedule of 24 round trips per day was maintained daily from 6 a.m. to 9 p.m., including Sundays and holidays, continuously for the rest of the year with the exception of 28 round

trips eliminated on account of rough water, running repairs or construction work on slips. During the year 387 additional round trips were provided during days when volume of traffic warranted. An additional watch was provided during April 14, 15, and 16 (Holy Week).

During the year the service made 17,996 trips, carrying 9,749 Panama Canal, 3,954 Army, and 133,401 other vehicles, a total of 147,104. By months the total ranged from 5,574 in August to 18,669 in April. Passengers carried totaled 837,174 and by months ranged from 27,996 in August to 108,576 in April. The opening of the new road has resulted in increased traffic, and new high records were established for a month and for a year, for both vehicles and passengers.

Because of interference from rough water, primarily when the wind is from the south or southwest, a breakwater was built on the south or sea side of the west ferry slip. It was built by dumping rock from pan cars, beginning from the west bank and extending the portable track as the fill advanced from the shore. The length of the breakwater is 550 feet and it contains 12,730 cubic yards of rock. The cost was $35,405 and the work was performed by the municipal division under the allotment of $184,000 for grading, filling, and similar work which could be performed advantageously at this time and afford a maximum of relief for unemployment. The work was begun in December 1932 and completed on June 30, 1933.

PUBLIC ORDER

The number of persons placed under arrest during the year was 2,811, of whom 122 were females and 2,689 males, as compared with 2,926 males and 164 females, a total of 3,090, in the preceding year. Of the arrests during the past year, 2,372 were made without warrants and 439 were made with warrants.

The more common causes of arrest were violations of vehicle and traffic regulations, 1,234; loitering, 380; immigration regulations, 322; disorderly conduct, 154; disturbing the peace, 146; petit larceny, 122; and battery, 113. The persons arrested included nationals of 70 countries and territories and were of 150 different trades and professions.

Four arrests were made of persons having in their possession narcotics in violation of the Narcotic Drugs Import and Export Act, three of whom were convicted in the courts. Consequent sentences imposed ranged from 2 to 5 years imprisonment in addition to fines.

Homicides totaled five during the year. Three were due to automobile accidents, including 2 cases of persons struck by automobiles;

1 was due to a hunter shooting the victim, mistaking him for game; and 1 was the victim of a shooting affair in which a sentence on the charge of second degree murder was later imposed.

Suicides during the year numbered 4, of which 2 were by firearms, 1 by jumping from a 3-story building, and 1 by striking his head against a wall while confined in the hospital. The coroner investigated 78 deaths during the year, 30 of which resulted from natural causes and 21 from accidental drowning. There were no deaths from snake bite.

The number of prisoners serving sentence in the common jails at the end of each month averaged 50. All prisoners who were physically able were employed on municipal work, public improvements, janitor and miscellaneous work at the police and fire stations, and at target ranges. The total value of such common jail labor is estimated at $18,365.97.

Thirty-four convicts were committed to the Canal Zone penitentiary during the year, with sentences aggregating 100 years and 6 months; a total of 24 was discharged. At the close of the fiscal year 67 convicts remained in custody, as compared with 57 at the end of the preceding year. Labor performed by convicts during the year was valued at $23,852.22, on the basis of standard rates of pay. Convicts were employed principally on municipal improvements, clearing trails, road work, and the cultivation of fruits, vegetables, etc., at the penitentiary farm and the experimental farm at Summit. The total value of fruits, vegetables, and other products of the penitentiary farm amounted to $4,475.10.

Thirty-eight persons were deported from the Canal Zone during the year. Of this number, 22 were convicts who had completed terms of imprisonment, and 16 were persons who had been convicted of misdemeanor charges or who were deemed undesirable persons to be permitted to remain in the Canal Zone.

Continuous patrol of the harbors of Balboa and Cristobal was maintained, principally for the enforcement of navigation laws and regulations and for the prevention of smuggling and irregular traffic. A police launch was maintained on Gatun Lake for patrol of the lake and regular inspection of the 100-foot contour area to determine if any unauthorized clearings or cultivation were being made, buildings erected, etc., and a police launch was also maintained at Gamboa for patrol of the Chagres River and the Canal in the vicinity of Gamboa. A total of four launches was maintained for effecting this patrol. Motorcycle patrols for the enforcement of vehicle traffic regulations and for special emergency police service were continued throughout the year over all the streets and roads of the Canal Zone. At Ancon and Cristobal a light passenger car was added to the patrol equipment.

Traffic accidents reported in the Canal Zone during the year totaled 423. These resulted in the death of 6 persons and injuries to 140. A classification of accidents by causes shows that practically all of these accidents were avoidable and were largely due to careless and reckless operators, including 12 cases of intoxicated operators.

Detective officers effected 117 arrests, and in addition made 898 investigations in cases of various natures, to obtain information in criminal cases and the whereabouts of persons wanted in other jurisdictions.

The usual routine work was carried on by the criminal identification bureau during the year and one conviction for first degree burglary was obtained solely on fingerprint evidence.

FIRE PROTECTION

During the year 110 fires, 4 special calls, and 7 false alarms were reported. Of the fires, 64 occurred in property of the Panama Canal, 14 in Panama Railroad property, 2 in United States Army property, 4 in United States Navy property, and 26 in private property. The total estimated loss from all fires during the year amounted to $527,371.07, of which $313.07 was in Panama Canal property, $551 in Panama Railroad property, $7 in United States Army property, $805 in United States Navy property, and $525,695 in private property. The total value of property involved was $4,710,990.40.

Periodical inspections of all government buildings, docks, storehouses, etc., were made, and fire extinguishers and other equipment maintained in good condition throughout the year; 12 fire extinguishers and 2,000 feet of fire hose were added to the fire-protection equipment, mostly by way of replacements. A 1,300-gallon combination pumping engine, booster tank, and hose car was also placed in service at Balboa, replacing a 750-gallon pumping engine transferred to Cristobal to retire a pumping engine at that station which had become unserviceable.

DISTRICT COURT

Regular sessions of the district court were held in both Balboa and Cristobal. The following is a summary of the cases handled during the year:

	Civil	Probate	Criminal	Total
Cases pending July 1, 1932	45	60	8	113
Cases filed during year	89	188	76	353
Total	134	248	84	466
Cases settled during year	72	143	57	272
Cases pending June 30, 1933	62	105	27	194

Of the civil cases disposed of, 53 were decided and 19 were dismissed; of the criminal cases disposed of, 4 were acquitted, 46 convicted, and 7 dismissed.

Marriage licenses issued numbered 722, and collections from fines, fees, licenses, etc., totaled $2,976.33.

In conformity with the authority conferred by the act of Congress approved July 5, 1932, the position of public defender of the Canal Zone was created and filled by the appointment of a member of the Canal Zone bar, effective August 6, 1932. The public defender's duties are to represent in the district court of the Canal Zone any person charged with the commission of a crime within the original jurisdiction of such court who is unable to employ counsel for his defense. During the fiscal year 1933 he represented the defense in 26 cases involving 41 persons prosecuted in the district court.

OFFICE OF THE DISTRICT ATTORNEY

The district attorney and his assistant prosecuted 69 criminal cases before the district court, and 28 criminal cases were pending at the close of the year. Of the 69 cases prosecuted, 9 were for violations of the National Prohibition Act, 7 for burglary, 6 for grand larceny, 6 for robbery, 4 for battery, 4 for returning to the Canal Zone after deportation, 4 for violation of the Narcotic Drugs Import and Export Act, and 4 for obtaining money by false pretenses.

The district attorney represented the United States Marshal in and for the Canal Zone in the matter of securing court orders covering the marshal's expenses in connection with detention of the steamship *Melmay* under order of the court.

Five cases of extradition were handled during the year; one for the return to the Republic of Czechoslovakia of an alleged fugitive from that country; one for detention of two Spanish citizens wanted in Habana, Cuba; one for detention and extradition to Peru of an alleged fugitive; one for return to Texas of an alleged fugitive; and one for return to the Canal Zone of an alleged embezzler who had reached New Orleans.

MARSHAL

During the year there were filed and pending from the previous year in the district court a total of 466 cases, of which 134 were civil, 4 were in admiralty, 248 probate, and 84 criminal. In the civil and probate cases there were 81 summonses and complaints, 50 subpenas for witnesses, 8 citations, and 4 restraining and other orders of the court; in the criminal cases, 40 mittimusses (penitentiary), 4 bench warrants, 3 citations, 117 subpenas for witnesses, and 2 commitments. The number of juries summoned during the year was 15. All liquor confiscated during the year was destroyed or

otherwise disposed of in accordance with the orders of the district court. All narcotics seized were forwarded direct to the Federal Narcotic Board in Washington, D.C., by order of the court.

Trust funds received and disbursed during the year amounted to $2,146.39. Revenues collected amounted to $242.32, and fees paid to witnesses and interpreters to $235.50.

MAGISTRATES' COURTS

BALBOA

In the magistrate's court for the town and subdivision of Balboa 13 cases were pending at the beginning of the fiscal year, 1,906 cases were docketed, and 1,899 cases were disposed of during the year, leaving 20 cases pending. Of the cases disposed of, 118 were civil and 1,781 were criminal. In the latter, 1,481 resulted in conviction, 128 in acquittal, 114 were dismissed, and 58 were held to the district court. Fines, costs, and forfeitures totaled $5,934.67.

CRISTOBAL

In the magistrate's court for the town and subdivision of Cristobal 19 cases were pending at the beginning of the fiscal year, 897 cases were docketed, and 904 cases were disposed of during the year, leaving 3 cases pending. Of the cases disposed of, 67 were civil and 837 were criminal. In the latter, 705 resulted in conviction, 71 in acquittal, 37 were dismissed, and 24 were held to the district court. Fines, costs, and forfeitures totaled $3,631.29.

PARDON BOARD

The pardon board, consisting of five members, acts under appointment of the Governor.

During the year 22 applications for executive clemency were referred to the pardon board by direction of the Governor. Three of these applications were in behalf of offenders sentenced in the magistrates' courts. Of these applications one was approved and two were denied. Nineteen applications were in behalf of offenders sentenced to the penitentiary by the district court and of these 2 were recommended for executive clemency, 14 were denied, and 3 were pending at the end of the year.

There were no changes in the personnel of the board during the year,

PUBLIC-SCHOOL SYSTEM

During the year 2 senior high schools, 2 junior high schools, and 6 elementary schools for white children, and 7 elementary schools for colored children were maintained. All elementary schools are graded. The elementary schools for white children are located at Ancon,

Balboa, Pedro Miguel, Paraiso, Gatun, and Cristobal. Schools for colored children are located in La Boca, Chiva Chiva, Red Tank, Paraiso, Gamboa, Frijoles, Gatun, and Cristobal. The school for colored children at Las Cascades was closed in July 1932, and in the same month the schools at Chiva Chiva and Frijoles were opened, each with two teachers. The school organization is comparable with the usual city school system in the United States, having a superintendent with assistants in general charge and a principal at each school; in the Canal Zone the schools are situated in the various towns rather than in sections of a city.

The number of pupils on the roll at the end of February, 1933, taken as representative, was 2,992 for the white schools and 4,118 for the colored schools, a total of 7,110. This was an increase over the corresponding month in 1932 of 59 pupils or 2.01 percent for white schools, and a decrease of 31 or seventy-five one hundredths of 1 percent for colored schools. Combined, the increase was 28, or four tenths of 1 percent. The net enrollment for the fiscal year was 3,264 white, 4,568 colored, as compared with 3,219 and 4,463 in the preceding year. The average daily attendance at the white schools was 2,858.2, and at the colored schools, 3,885.9, throughout the year.

The per capita expense of maintenance, based on average daily attendance, amounted to $58.20, as compared with $73.11 for the preceding year. The total expenditures for the division of schools during the year amounted to $392,531.52. Tuition collected, books and school material sold, etc., amounted to $18,251.61.

The teachers corps of the Canal Zone schools is composed of 7 principals and 101 teachers for the white schools, and 8 principals and 93 teachers for the colored schools. The usual high standards as to educational qualifications were exacted in the employment of new teachers.

The work of carrying out the curriculum revision program that has been in progress during the past 3 years represented the major activity in the Canal Zone white schools during the year. A great deal of time and study has been devoted to professional books and to specimen courses of study from the leading school systems in the United States, and an effort is being made to profit from the best that is done in other schools and by adapting their methods to the local situation in the Canal Zone.

A new junior-senior high school building was completed at Cristobal at the end of the fiscal year and will be occupied during the coming year. With the completion of this building all of the white schools are considered to be adequately housed with the exception of that at Balboa. This school is now conducted in eight wooden buildings in addition to the main concrete building. Plans are in preparation for

a new junior-senior high school and junior college plant that will house these units in four or five new concrete buildings.

Junior College.—Plans for the establishment of a 2-year junior college at Balboa have been completed during the year and this organization will commence operation at the opening of the school term in September 1933. Due to the urgent need for 2 additional years of school work, the junior college has been established in temporary quarters until permanent building facilities can be provided.

The most important work done in the colored schools during the year was the extension of vocational training in the four larger schools and the establishment of school gardens at all colored schools. The vocational classes include carpenter shop practice for boys and household arts and "home-making" course for girls, the latter providing a study of the care of children and problems in efficient and economical home operation on small incomes.

POSTAL SYSTEM

A total of 13 post offices were in operation throughout the fiscal year, all of which are authorized to transact money-order business. The gross receipts for the postal service were $297,082.22, as compared with $286,179.14 for the previous year, an increase of $10,903.08, or 3.81 percent. Expenditures aggregated $195,542.87, as compared with $214,092.83 for the previous year. The receipts exceeded the expenditures by $101,539.35 for the year.

The sale of postage stamps, postal cards, stamp books, etc., amounted to $203,422.33 of the total receipts above mentioned.

The practice of issuing deposit money orders in lieu of postal savings certificates was continued. Because of the general closing of banks in the United States in March 1933, there was a marked increase in the volume of deposits in this system, although all banks in the Republic of Panama and the Canal Zone remained open and operated without restriction during the crisis. Two of the banks in Washington in which surplus deposit money-order funds were deposited closed their doors as a result of the banking crisis. However, such deposits were protected by collateral deposited with the Panama Canal and there should be no loss when ultimate adjustments are made. Negotiations were in progress at the end of the fiscal year for the investment of a portion of surplus money-order funds in United States Government bonds. The balance remaining on deposit at the end of the fiscal year was $1,650,540 as compared with $1,210,690 on deposit at the close of the previous fiscal year. The interest receipts during the year on these deposits exceeded the interest paid to depositors by $24,531.72.

There were 178,521 money orders, including deposit money orders, issued during the year, amounting to $4,484,181.12, on which fees

amounting to $15,305.51 were collected. Compared with the preceding fiscal year, there was an increase of 22,805 in the number of orders issued, and an increase of $1,639.04 in the amount of fees collected.

In the registry division of the post offices, 210,044 letters and parcels were handled, as compared with 230,409 for the previous fiscal year. Of this total, the articles dispatched numbered 102,870, divided as follows: 22,253 domestic letters; 213 domestic registered parcels; 28,016 foreign letters; 3,404 foreign registered parcels; 42,733 official letters and parcels (registered free); 6,251 c.o.d. and insured parcels.

During the year a total of 1,983 dispatches of mail was made by the Cristobal post office to the United States and foreign countries by ocean vessels, of which 310 were to the United States and 1,673 to foreign countries. The Balboa post office, which dispatches mail to the west coast exchange of the United States and Central and South America, made 1,830 and received 1,428 disptaches during the year.

Air mail.—The air mail schedules to and via the Canal Zone remained unchanged throughout the year and dispatches were made with regularity. The schedules continue to be well maintained despite the hazards of the long flights. No change was made in the air mail postage rates to foreign countries during the year but an upward revision was made in the rates for United States domestic service. The local effect was negligible due to the faster service afforded by the direct service compared with the steamer-plane dispatches. The decrease in volume of mail handled to and via the United States compared with the previous year was 13 percent. A decrease of 11 percent occurred in the volume of air mail matter dispatched to South American countries.

The Cristobal post office continued to act as a clearing house for air mail exchanged between the United States and South America. The records indicate that the volume of mail decreased about 6 percent during the past year. It is considered that this work, performed on behalf of the United States Post Office Department, requires the equivalent of the full-time services of two or more gold employees.

During the year the Cristobal post office forwarded 4,874 air mail dispatches and received a total of 6,410 dispatches. A comparison of these figures with 4,415 dispatches made and 5,701 dispatches received during the previous year is indicative of the increased overhead attributed to the handling of air mail matter on behalf of the United States.

CUSTOMS

The various activities of the bureau of customs were continued along the lines explained in previous reports. The following is a

statistical summary of the principal items, with the figures for the preceding year shown for comparison:

Item	Fiscal year— 1932	1933
Vessels entered	10,081	9,678
Vessels cleared	10,086	9,670
Total	20,167	19,348
Vessels of United States registry entered	4,230	3,818
Vessels of United States registry cleared	4,230	3,815
Customs releases on shipments consigned to Panama (Cristobal, 8,782; Balboa, 692)	10,824	9,474
Free entry releases for shipments to employees of United States Government	5,670	5,532
Arrests for violations of: Narcotic drug import and export act	1	4
Shipments of household goods of employees of United States, inspected and sealed for shipment to United States	99	96
Pieces of freight included in above	663	668
Invoices certified for shipment to United States	728	704
Special customs inspections out of regular hours:		
Cristobal	521	379
Balboa	306	322
Total	827	701
Fees collected for above	$5,480	$4,715
Cargo deposited to be held for orders ("Canal Zone for orders"):		
Cristobal.		
Consignments received	1,287	1,253
Releases for delivery or forwarding	8,091	9,154
Balboa:		
Consignments received	502	485
Releases for delivery or forwarding	2,883	3,176
Chinese passengers arriving	760	653
Admitted to Panama	424	264
Vessels with Chinese crews checked	671	540

SHIPPING COMMISSIONER

The shipping commissioner and his deputies have the same powers as shipping commissioners in United States ports and United States consuls in foreign ports with respect to United States seamen. During the year there were 987 seamen shipped on vessels of the United States and 901 discharged. No destitute seamen were returned to the United States at the expense of the appropriation for the relief of destitute seamen, but 159 were signed on vessels as seamen or workaways and returned to the United States without expense to the Government.

Wages earned by seamen discharged at Canal Zone ports aggregated $31,835.61; the total approved for deductions on account of advances, allotments, fines, slop-chest account, etc., was $8,188.88, and $23,646.73 was either paid to seamen under the supervision of the deputy shipping commissioners or received on deposit for the seamen by the deputy shipping commissioners. The wages, money, and effects of two United States seamen who died in Canal Zone hospitals, or who died at sea and were brought to the Canal Zone for interment, were handled by the shipping commissioner during the year.

ADMINISTRATION OF ESTATES

During the year the estates of 102 deceased or insane employees of the Panama Canal and Panama Railroad Co. were settled, as compared with 86 for 1932 and 125 for 1931. There were 22 estates in the course of administration at the close of the year, and in addition there were 84 cases under investigation in which no money or other property had been received.

LICENSES AND TAXES

Licenses issued for motor vehicles, permits for peddling foodstuffs, the sale of merchandise generally, ships' runners, and similar purposes issued during the year numbered 9,587, and in addition 2,270 motor-vehicle transfers were recorded. The total fees collected for licenses and transfers amounted to $50,038.54, as compared with $52,143.07 for 1932 and $51,295.46 for 1931.

The number of motor-vehicle licenses and transfers, and miscellaneous licenses issued during the past 10 years, and the aggregate fees collected therefor are summarized next below. These include licenses to official vehicles:

Year	Motor-vehicle licenses	Motor-vehicle transfers	Bicycle licenses [1]	Miscellaneous licenses	Total	Fees
1924	2,852	808	1,033	1,374	6,067	$22,006.98
1925	3,464	1,026	1,024	1,387	6,901	25,061.41
1926	4,185	1,192	539	1,562	7,478	30,126.90
1927	5,107	1,391	1,074	1,327	8,899	34,731.79
1928	5,543	1,490	806	1,070	8,909	36,875.89
1929	6,345	1,729	17	1,076	9,167	40,894.39
1930	7,280	1,862	1	1,063	10,206	45,603.84
1931	8,128	2,083	----------	1,443	11,654	51,295.46
1932	8,577	1,906	2	1,310	11,795	52,143.07
1933	8,432	2,270	----------	1,155	11,857	50,038.54

[1] Bicycle licenses not required since 1928 except on bicycles in official use.

INSURANCE

Life insurance companies licensed to transact business in the Canal Zone reported 634 policies in force as of December 31, 1932. During the calendar year 1932, 149 policies were issued and 105 canceled, leaving 678 in force as of December 31, 1932. The face value of these policies aggregated $1,958,233, on which premiums of $88,863.89 were collected during the year.

During the year 1932, the premiums received by miscellaneous insurance companies, including accident, auto liability, fidelity, fire, surety, etc., but excluding life insurance, aggregated $75,107.29; losses paid during 1932 totaled $33,133.49.

All of the nine insurance companies previously authorized to do business in the Canal Zone renewed their licenses for the past year and one additional accident and indemnity company secured a license during the year.

IMMIGRATION VISAS

During the year a total of 24 visas were issued by the executive secretary to alien residents of the Canal Zone going to the United States. Of these, one was a quota visa, 15 were nonquota, and 8 were nonimmigrant visas. Fees collected for visas amounted to $172.

RELATIONS WITH PANAMA

During the year direct correspondence was conducted between the Governments of the Canal Zone and the Republic of Panama with reference to various matters of joint interest, arising from the relations of the two Governments and the proximity of their respective areas. Most of this was of a routine nature dealing with problems relating to aviation, customs duties, customs, inspection, extradition, garbage collection, immigration, automobile licenses, municipal improvements, annual and complimentary passes over Panama Railroad, public health, schools, etc., while matters of less routine nature included the ferry schedule, transfer of insane patients to Panama, registrations or repatriation of aliens, and aviation regulations.

COMMERCIAL AVIATION

During the year regular commercial plane service was inaugurated between Cristobal and points in the Republic of Colombia by the Uraba Medellin and Central Airways, Inc. A weekly plane schedule was likewise inaugurated by Pan American Airways, Inc., between Cristobal and Guatemala City, Guatemala.

The following shows the number of passengers carried by the various commercial airways operating in Canal Zone and foreign and intra-Canal Zone air commerce during the year, with the approximate percentage of increase as compared with the passengers carried during the preceding year:

	Pan American Airways (including U.M.C.A.)	Pan-American-Grace Airways, Inc.	Isthmian Airways, Inc.
Canal Zone and foreign:			
Incoming	827	276	----------
Outgoing	743	213	----------
Approximate percent of increase	54	69	----------
Intra-Canal Zone:			
Total passengers carried	----------	----------	6,913
Approximate percent of increase	----------	----------	9

CODIFICATION OF THE LAWS OF THE CANAL ZONE

The revision and codification of the laws of the Canal Zone, authorized under the provisions of the act of Congress approved May 17, 1928, approached completion when the remaining 11 bills pro-

viding for the revision of the laws were passed by Congress and approved by the President in February 1933. All of the revised laws are now in force except the Civil Code and the Code of Civil Procedure, which will become effective on October 1, 1933. There remains only the task of compiling and codifying the laws as revised, to be begun in the Washington office of the Panama Canal on July 3, 1933, by Mr. Paul A. Bentz, codifier appointed by order of the President. It is expected that the code will be completed in time for submission to Congress at the beginning of the session which starts in January 1934.

SECTION V

FINANCIAL AND STATISTICAL STATEMENTS

Financial statements of major interest relative to the Panama Canal are presented in this section. These statements are abstracted from the annual report of the accounting department.

ACCOUNTING SYSTEM

The accounting system of the Panama Canal was modified during the fiscal year 1932, as related in last year's report, to a form recommended by the bureau of efficiency and embodying as far as practicable the principles and practices approved by the Interstate Commerce Commission and State boards regulating public utilities. The system was designed to show the relationship of the capital investment and the revenues in their proper perspective and proportions, and its adoption was approved by the President. It was continued in effect through the fiscal year 1933 without modification except with respect to the minor matters of new accounts or slight changes in old accounts in harmony with changed circumstances but in accordance with the principles of the approved system.

The accounting system fixes July 1, 1921, as the close of the construction and development period of the Panama Canal, for accounting purposes in that all interest on United States Treasury funds advanced up to that time has been capitalized. Capital interest subsequent to that date, while not included on the balance sheet, is considered as a statistical charge to operating expenses for comparison with net revenues. Additions to the capital investment account are made from time to time by the inclusion of the cost of new capital additions (such as the Madden Dam); deductions are made of the amounts of withdrawals and retirements of capital assets, such as through the sale of property or the absorption of value of buildings or equipment through charges for depreciation.

Based upon the foregoing principles, the capital investment at the beginning of the fiscal year 1933 stood at $533,106,009.47. Interest at 3 percent on this amount is $15,993,180.28 and such interest is considered a charge to operating expenses for the year.

At the end of the fiscal year 1933, following the same principles, the capital investment was $539,200,059.23, and the interest charge for the fiscal year 1934 will be reckoned on that amount.

The net revenues of the Canal during the fiscal year 1933 amounted to $10,775,500.75 on Canal operations and $1,135,708.62 on business operations, a total of $11,911,209.37. With respect to the capital investment of $533,106,009.47 at the beginning of the year this revenue represents a return of 2.23 percent. The corresponding figure for 1932 was 2.22 percent. The net revenue in 1933 fell short of meeting the 3 percent interest charge of $15,993,180.28 by $4,081,970.91.

OPERATIONS WITH PANAMA RAILROAD CO. FUNDS

The results from the operations of the railroad proper and its various business units on the Isthmus are shown in detail in the accounts of the Panama Railroad Co., and detailed statement of revenue, expenses, and statistics of all railroad industries, changes in the capital account, and the results from the operations of the steamship line, appear in the regular annual report of the Panama Railroad Co. Inasmuch as these activities are related closely to the operation of the Panama Canal the major facts with regard to them are summarized in the report of the Canal.

The operations of the railroad proper, harbor terminals, coaling plants, stables, and baggage transfer, were continued throughout the fiscal year, under the direction of the general manager; the telephone system, under the electrical engineer of the Panama Canal; renting of lands and buildings, under the land agent; and the hotels, commissaries, plantations, dairy farm, and cattle industry, under the chief quartermaster of the Panama Canal. A review of these activities is presented in Section II of this report under the heading, "Business operations under the Panama Railroad."

The net result from all Panama Railroad operations on the Isthmus during the fiscal year 1933 was a profit of $784,432.28, as compared with $782,464.49 for the preceding year, an increase of $1,967.79, approximately one fourth of 1 percent.

PANAMA CANAL OPERATIONS

The major financial results of Panama Canal operations are presented hereinafter in tables nos. 1 to 27, inclusive, with supplementary comments and explanations.

The following is a list of all of the tables and bureau reports contained in the annual report of the accounting department. The tables and reports nos. 28 to 58, inclusive, are not published because they are concerned principally with details of operation which lack general interest and their publication would be an unwarranted expense. The complete report for the accounting department, as well as those of the other departments and divisions, may be con-

sulted at the office of the Governor or at the Washington office of the Panama Canal. For purposes of reference the complete list of tables and reports for the accounting department is published below. Following the list are presented the major tables nos. 1 to 27, inclusive, with various notes of explanation.

General Balance Sheet

Table no.

ASSETS

1. General balance sheet
2. Canal fixed property and equipment
3. Administrative and civil property
4. Business fixed property and equipment
5. Public works, Republic of Panama
6. Revenues due United States Treasury
7. Security deposit funds
8. Independent trust funds
9. Cash receipts and disbursements
10. Accounts receivable registered and outstanding
11. Stores
12. Work in progress
13. Deferred charges

LIABILITIES

14. Capital investment
15. Accounts payable
16. Reserve for replacements
17. Reserve for repairs
18. Operating reserve
19. Deferred credits
20. Income, expenses, and net revenue (current)
21. Revenues, expenses, and computed surplus
22. Capital of refundments (miscellaneous receipts and Canal appropriations)
23. Balance of revenues and refundments

Details of Operations for Profit and Loss
(Summaries are contained in tables 21 and 22)

24. Canal revenues
25. Canal earnings, expenses, and net revenues
26. Business revenues, expenses, and net revenues

Miscellaneous

27. Balances in appropriation and fund accounting

Addenda Not Published

(May be seen at Balboa Heights or Washington office of the Panama Canal—see prefatory notes)

28. Cost of electric current
29. Cost of dredging
30. Collection of United States funds by collector
31. Money-order business, Canal Zone
32. Postal-service revenues
33. Death and injury accidents and payments
34. Payments by the paymaster
35. Audited pay rolls
36. Pay-roll deductions, gold employees

37. Cost of production of water
38. Money-order statistics
39. Postal-service statistics
40. Clubs and playgrounds, income and expenditures
41. Clubs and playgrounds, balance sheet
42. Commissary coupons issued
43. Cost of commissary supplies
44. Rent collections from nonemployees
45. Land-rent collections, Panama Railroad
46. Silver quarters statistics
47. Accounts payable registered, Panama Canal
48. Accounts payable registered, Panama Railroad
49. Employees bonds
50. Report of accounting bureau
51. Report of pay-roll section
52. Payments account of deaths and injuries
53. Report of personal-injury claims
54. Report of freight and cargo claims
55. Report of collections from silver employees
56. Report of general inspection bureau
57. Report of time inspection bureau
58. Report of property inspection bureau

MAJOR ACCOUNTING TABLES WITH SUPPLEMENTARY NOTES

The following is the general balance sheet of the Panama Canal at the end of the fiscal year 1933:

TABLE No. 1.—*General balance sheet June 30, 1933*

ASSETS

Capital assets:		
Canal fixed property and equipment (table no. 2)	$494,168,312.00	
Administrative and civil property (table no. 3)	12,017,208.41	
Business fixed property and equipment (table no. 4)	27,264,922.75	
Total capital assets		$533,450,443.16
Reimbursable capital expenditures:		
Public works, Republic of Panama (table no. 5)		1,374,616.07
Revenues due United States Treasury (table no. 6)		250,852.79
Special funds:		
Security deposit funds (table no. 7)	502,676.31	
Independent trust funds (table no. 8)	2,239,639.54	
Total special funds		2,742,315.85
Working assets:		
Appropriated cash in United States treasury (table no. 9)	7,456,081.22	
Appropriated cash with fiscal officers (table no. 9)	1,615,300.00	
Accounts receivable (table no. 10)	587,568.32	
Stores (table no. 11)	3,960,783.48	
Work in progress (table no. 12)	52,281.00	
Total working assets		13,672,014.02
Deferred charges (table no. 13)		176,872.02
Total assets		551,667,113.91

LIABILITIES

Capital investment:		
Net appropriations by Congress	$395,547,698.80	
Interest on appropriations	143,652,360.43	
Total capital investment (table no. 14)		$539,200,059.23
Special fund obligations (see assets)		2,742,315.85
Working liabilities:		
Accounts payable (table no. 15)		1,216,427.50
Funded reserves:		
Reserve for replacements (table no. 16)	4,080,806.83	
Reserve for repairs (table no. 17)	785,904.87	
Operating reserve (table no. 18)	474,010.30	
Total funded reserves		5,340,722.00
Deferred credits (table no. 19)		406,871.66
Revenues and refundments:		
Net revenues to June 30, 1932	160,888,376.23	
Net revenues fiscal year 1933 (table no. 20)	11,911,209.37	
Total net revenues (table no. 21)	172,799,585.60	
Reserve for depreciation (unfunded)	14,141,278.26	
Total	186,940,863.86	
Less capital refundments (table no. 22)	184,180,146.19	
Balance of revenues and refundments (table no. 23)		2,760,717.67
Total liabilities		551,667,113.91

The terms and arrangement of the foregoing balance sheet follow closely the generally accepted principles of corporate accounting, except as to the last item "Revenues and refundments." The statutes require that all receipts for tolls and certain other collections, such as postal receipts, civil revenues, and net profits on business operations shall be covered into the United States Treasury, and relinquished from control of the Panama Canal.

Funds for current operating expenses and capital construction are appropriated by the Congress, and for accounting purposes are considered as provided from the tolls and other receipts covered into the Treasury. Practically all receipts other than those cited above are repayable to Canal appropriations, and may be reexpended, but as the Canal is deprived of tolls revenues, its principal source of income, the reexpendable receipts are insufficient to provide for operation and maintenance, thus requiring the Canal to submit its expenditure program annually to the Congress.

Total net revenues, appearing under the caption "Revenues and refundments," represent the accumulated operating earnings of the Panama Canal before capital interest charges. This net revenue, however, has been covered into the United States Treasury in the form of tolls and other receipts. It therefore follows that net capital refundments and net revenues earned will always be approximately the same, except for the fluctuation of unexpended appropriated cash and other current items.

The item "Reserve for depreciation (unfunded)" has been charged against "Net revenues," but is restored thereto in the balance sheet exhibit because this expense is not covered by Canal appropriations, and the cash representing this reserve has therefore been covered into the Treasury in the form of tolls. This charge is made solely for the purpose of adjusting "Net revenues" to allow for depreciation of general property items which will probably not require replacement within 50 to 100 years, or longer.

The "Funded reserves," under a separate balance sheet caption are also charged against current operations, but differ from the "Reserve for depreciation" in that these charges are included in operating appropriations, and are therefore represented in the appropriated fund balances under "Working assets."

These various fund requirements leave the Panama Canal balance sheet without an equivalent for the usual corporate "Surplus account," since any surplus is included in the tolls covered into the Treasury, by law. However, the equivalent for "Surplus account" is shown on Table no. 21, which compares "Total net revenues" of $172,799,-585.60, appearing on the balance sheet, with the computed interest on the capital investment, by years, from July 1, 1922, but no interest charge against the Canal is actually made by the United States Treasury.

The general accounts in the above balance sheet are shown in detail under the table numbers listed opposite each item.

TABLE NO. 2.—*Canal fixed property and equipment, fiscal year 1933*

	Balance July 1, 1932	Additions	With-drawals	Balance June 30, 1933
CANAL FIXED PROPERTY				
Channels, harbors, and basins:				
Balboa to Pedro Miguel	$24,309,928.86			$24,309,928.86
Pedro Miguel to Gatun	113,416,691.77			113,416,691.77
Gatun to Cristobal	12,829,445.51			12,829,445.51
Breakwaters:				
Naos Island	1,075,874.10			1,075,874.10
Colon, East	3,994,727.10			3,994,727.10
Colon, West	4,528,829.57			4,528,829.57
Locks:				
Miraflores	24,586,787.54			21,586,787.54
Pedro Miguel	16,770,362.46			16,770,362.46
Gatun	37,914,498.12			37,914,498.12
Dams:				
Miraflores	1,228,561.63			1,228,561.63
Pedro Miguel	457,302.32			457,302.32
Madden	4,151,515.55	$3,751,940.14		7,903,455.69
Gatun	10,475,943.56			10,475,943.56
Gatun-Mindi Levee	148,974.22			148,974.22
Spillways:				
Miraflores	1,398,684.94			1,398,684.94
Gatun	4,323,538.02			4,323,538.02
Aids to navigation:				
Lighthouses and beacons	548,769.52			548,769.52
Buoys and other markers	295,473.80			295,473.80
Buildings and landings	127,318.29			127,318.29
Wharves and piers:				
Balboa (nos. 14-19)	3,317,826.59			3,317,826.59
Cristobal (no. 6)	2,332,550.24			2,332,550.24

TABLE NO. 2.—*Canal fixed property and equipment, fiscal year 1933*—Contd.

	Balance July 1, 1932	Additions	Withdrawals	Balance June 30, 1933
CANAL FIXED PROPERTY—continued				
Drydocks:				
Balboa	$3,576,872.10			$3,576,872.10
Cristobal	77,832.37			477,832.37
Extension (part)		$400,000.00		
Coaling plants:				
Balboa	3,679,797.59			3,679,797.59
Cristobal	2,284,568.35			2,284,568.35
General capital expenditures:				
Purchase price new Panama Canal Co	[1] 31,717,335.97			31,717,335.97
Treaty payment to Republic de Panama, 1904	10,000,000.00			10,000,000.00
Annual treaty payments to Republic de Panama, 1913–21	2,250,000.00			2,250,000.00
Relocation Panama Railroad	9,800,626.46			9,800,626.46
Reequipment of Panama Railroad	3,247,332.11			3,247,332.11
Depopulation of Canal Zone	2,701,016.24			2,701,016.24
Interest during construction period	143,652,360.43			143,652,360.43
Total, Canal fixed property	481,221,345.33	4,151,940.14		485,373,285.47
CANAL EQUIPMENT				
Tugs	1,400,106.24			1,400,106.24
Supply boats	51,544.48			51,544.48
Launches	332,082.22			343,508.77
Egret, built		7,085.00		
Hawk, built		6,834.19		
Teal, built		6,801.01		
Priscilla, surveyed			$4,414.75	
Taboguilla, surveyed			1,556.34	
Urava, surveyed			3,322.56	
Dredges	2,325,906.76			2,325,906.76
Lighters and scows	1,310,120.38			1,334,360.33
Barge *No. 96*, rebuilt		5,500.00		
Barge *No. 97*, rebuilt		5,500.00		
Barge *No. 170*, rebuilt		5,500.00		
Barge *No. 195*, rebuilt		2,142.96		
Barge *No. 226*, rebuilt		6,000.00		
Barge *No. 95*, surveyed			403.01	
Floating cranes	659,524.29			659,524.29
Crane boats	30,000.00			294,821.05
Atlas, built (part)		264,821.05		
Barges	298,538.30			298,538.30
Ferryboats	255,860.15			255,860.15
Floating caisson (locks)	347,868.15			347,868.15
Towing locomotives (locks)	1,447,309.81			1,449,538.01
3 units, completion		2,228.20		
Automobiles	1,248.24		1,248.24	
Excavator	17,370.00			17,370.00
Cranes	16,030.00			16,030.00
Reserve equipment				50.00
Orange-peel bucket		50.00		
Total, Canal equipment	8,493,509.02	312,462.41	10,944.90	8,795,026.53
Total, Canal fixed property and equipment	489,714,854.35	4,464,402.55	10,944.90	494,168,312.00

[1] Original purchase price of $40,000,000 less Panama Railroad capital stock and sales and transfers of property acquired.

TABLE NO. 3.—*Administrative and civil property, fiscal year 1933*

	Balance July 1, 1932	Additions	Withdrawals	Balance June 30, 1933
Buildings:				
Office buildings	$2,015,397.02			$2,015,397.02
Gorgas Hospital	1,800,047.49			1,800,047.49
Corozal Hospital	604,992.48			604,992.48
Colon Hospital	280,430.99			343,290.51
Nurses' quarters (completion)		$56,940.26		
New ward (part)		1,792.14		
Covered passageway		4,127.12		
Dispensaries	162,234.73			170,427.88
Colon (part)		8,193.15		
Palo Seco Leper Colony	76,928.46			76,928.46
Quarantine stations	63,392.70			63,392.70

TABLE NO. 3.—*Administrative and civil property, fiscal year 1933*—Continued

	Balance July 1, 1932	Additions	Withdrawals	Balance June 30, 1933
Buildings—Continued.				
Other health-department buildings	$69,356.82			$99,446.94
Incinerator, Summit (completion)		$30,090.12		
Clubs and playgrounds	229,884.85			230,034.85
Building no. 1087, La Boca (transferred)		150.00		
Post offices	22,352.62			22,352.62
School houses	993,492.64			1,362,662.75
Junior high school, Balboa (part)		38,043.78		
Building no. 710½, Balboa, purchased		3,000.00		
Elementary school, La Boca (completion)		1,923.58		
High school, Colon Beach (part)		326,202.75		
Fire stations	104,876.74			104,876.74
Police stations	32,719.47			32,719.47
Prisons	30,000.00			30,000.00
Courthouses	130,892.39			130,892.39
Other buildings and structures	53,385.09			53,385.09
Permanent townsites	1,186,822.53	152,300.23		1,339,122.76
Roads, streets, and sidewalks	2,558,197.95			2,839,269.09
Thatcher Highway (completion)		119,717.83		
La Boca Road, widened		42,381.21		
Grading Paraiso Hill Road (part)		15,997.82		
Palo Seco Road		34,400.55		
La Pita Station Road		4,498.71		
Breakwater, west side ferry slip		38,287.73		
Corozal Hospital Road		14,947.23		
Miscellaneous		10,840.06		
Storm sewers	540,653.80			553,815.74
Corundu		10,295.43		
Miscellaneous		2,866.51		
Street-lighting system	142,413.16	1,740.27		144,153.43
Total, administrative and civil property	11,098,471.93	918,736.48		12,017,208.41

TABLE NO. 4.—*Business fixed property and equipment, fiscal year 1933*

	Balance July 1, 1932	Additions	Withdrawals	Balance June 30, 1933
BUSINESS FIXED PROPERTY				
Hydroelectric plant, Gatun	$1,662,456.79			$1,662,456.79
Miraflores power plant	1,524,416.92			1,524,416.92
Substations	1,874,940.11			1,977,992.17
Supervisory control (completion)		$63,938.34		
Substation, Gatun (part)		39,113.72		
Transmission system	1,355,733.38			1,355,733.38
Distribution system	1,180,037.69	21,796.60		1,201,834.29
Total, electric light and power system	7,597,584.89	124,848.66		7,722,433.55
Balboa electrical shop (completion)	52,574.67	129,561.21		182,135.88
Balboa battery charging station (completion)	6,461.06	12,097.55		18,558.61
Total, electric work	59,035.73	141,658.76		200,694.49
Zone water system	849,387.33			855,203.91
Water line, extensions		5,816.58		
Zone-Panama water system	1,842,509.46			1,842,509.46
Zone-Colon water system	819,487.36			819,487.36
Total, water system	3,511,384.15	5,816.58		3,517,200.73
Balboa shops	2,331,377.80			2,331,377.80
Cristobal shops	475,435.20	15,356.38		490,791.58
Total, mechanical division	2,806,813.00	15,356.38		2,822,169.38
Balboa fuel oil plant	735,011.82			735,011.82
Cristobal fuel oil plant	791,850.37			1,068,298.58
Improvements, Mount Hope		276,448.21		
Total, fuel oil plants	1,526,862.19	276,448.21		1,803,310.40
General storehouses	1,072,621.43			1,072,621.43
Motor transportation	35,888.18			35,888.18
Motor car repair shop	19,419.77			20,999.77
Paint and storage shed		1,580.00		

TABLE NO. 4.—*Business fixed property and equipment, fiscal year 1933*—Continued

	Balance July 1, 1932	Additions	Withdrawals	Balance June 30, 1933
BUSINESS FIXED PROPERTY—continued				
Building repairs and construction	$53,599.84			$58,661.61
New saw mill, Balboa		$3,283.53		
Storage shed, Balboa		11,266.24		
Old saw mill			$9,488.00	
Panama Canal Press	161,000.00			161,000.00
Gold quarters	5,729,433.26			5,940,771.79
Miscellaneous additions		52,397.69		
New quarters, Cristobal district		247,197.40		
New quarters, Ancon-Balboa district		62,486.64		
Land improvements (transferred)			79,243.20	
Demolished			71,500.00	
Silver quarters	680,752.85			688,696.49
Building no. 900, La Boca		10,138.52		
Rebuilt		2,505.12		
Transferred			150.00	
Demolished			4,550.00	
Rented buildings	706,066.11			715,171.19
Waiting room, Thatcher Ferry		2,516.70		
Garage stalls			605.25	
Silver restaurant, La Boca		12,193.63		
Old Silver restaurant, La Boca			5,000.00	
Hotel Tivoli	153,054.40			153,054.40
Total, business fixed property	24,113,515.80	969,694.06	170,536.45	24,912,673.41
BUSINESS EQUIPMENT				
Electric light and power system:				
Machinery and tools	11,652.02			11,652.02
Electric ranges	164,598.37	16,873.87		181,472.24
Electric heaters	13,736.15	1,609.16		15,345.31
Electric work:				
Machinery and tools	23,191.12			23,191.12
Automobiles	3,464.29	3,050.30		6,514.59
Ditcher	1,675.00			1,675.00
Telephone, telegraph, and signal work: Machinery and tools	7,226.40			7,226.40
Water system: Machinery and tools	22,325.18			22,325.18
Municipal engineering work:				
Machinery and tools	145,499.20	14,548.12	6,628.00	153,419.32
Road rollers	30,082.27			30,082.27
Shops and drydocks: Machinery and tools	1,176,961.24			1,176,961.24
Fuel oil plants: Machinery and tools	5,678.93			5,678.93
Motor transportation:				
Machinery and tools	10,408.27			10,408.27
Automobiles	522,730.75	17,357.88	68,251.39	471,837.24
Mules	2,801.21			2,801.21
Motor car repair shop: Machinery and tools	21,818.83			21,818.83
Building repairs and construction: Machinery and tools	57,666.34			57,666.34
Panama Canal Press: Machinery and tools	17,939.68			17,939.68
Rented buildings—restaurants, Equipment	27,679.87			27,679.87
District quartermasters' supplies: Equipment	5,943.93	525.32		6,469.25
Hotel Tivoli: Equipment	72,657.50			72,657.50
Farm bureau:				
Equipment	1,145.50			1,145.50
Mules	1,086.76			1,086.76
Launch La Garza	2,117.50			2,117.50
Marine salvage section:				
Machinery and tools	17,927.77			17,927.77
Barges	5,150.00			5,150.00
Total, business equipment	2,373,164.08	53,964.65	74,879.39	2,352,249.34
Total, business fixed property and equipment	26,486,679.88	1,023,658.71	245,415.84	27,264,922.75

TABLE NO. 5.—*Public works in cities of Panama and Colon fiscal year, 1933*

	Panama	Colon	Total
Status of capital cost to June 30, 1933:			
Construction cost:			
Waterworks and sewers	$876,353.22	$623,883.68	$1,500,236.90
Pavements	592,913.23	625,619.03	1,218,532.26
Total construction cost	1,469,266.45	1,249,502.71	2,718,769.16
Amortization:			
Waterworks and sewers	424,984.10	302,368.08	727,352.18
Pavements	295,782.97	321,017.94	616,800.91
Total amortization	720,767.07	623,386.02	1,344,153.09
Capital cost reimbursable:			
Waterworks and sewers	451,369.12	321,515.60	772,884.72
Pavements	297,130.26	304,601.09	601,731.35
Capital value June 30, 1933	748,499.38	626,116.69	1,374,616.07
Operating detail fiscal year 1933:			
Operation, maintenance, and repairs:			
Waterworks and sewers	75,866.20	40,622.72	116,488.92
Pavements	24,927.01	20,999.36	45,926.37
Proportion, Zone system	96,016.59	30,952.69	126,969.28
Street cleaning and garbage collection	65,115.02	39,100.53	104,215.55
Total	261,924.82	131,675.30	393,600.12
Interest at 2 percent per annum:			
Waterworks and sewers	9,165.09	6,578.40	15,743.49
Pavements	6,033.25	6,184.95	12,218.20
Proportion, Zone system	13,817.78	6,920.07	20,737.85
Total	29,016.12	19,683.42	48,699.54
Amortization:			
Waterworks and sewers	18,515.32	13,188.68	31,704.00
Pavements	12,188.39	12,494.85	24,683.24
Total	30,703.71	25,683.53	56,387.24
Total charged to water rentals	321,644.65	177,042.25	498,686.90
Water rental collections in the Republic of Panama	321,644.65	177,042.25	498,686.90

The Panama Canal supplies water to the cities of Panama and Colon from the Canal Zone water system, and maintains the sewers and streets in the two cities under a contract entered into between the Panama Canal and the Republic of Panama in 1907. The Panama Canal collects the water rentals from the residents of these two cities and uses the funds to cover the cost of the water and maintenance of sewers and streets, interest on the unamortized investment at 2 percent per annum and amortization based on 50 years from 1907. Interest on the investment amounting to $1,383,120.96 and $1,344,153.09 repaid on the capital cost has been covered into the United States Treasury as miscellaneous receipts, United States revenues.

TABLE NO. 6.—*Revenue due United States Treasury*

	Fiscal year 1932	Fiscal year 1933
Cash	$91,863.30	$250,752.79
Outstanding audited bills	100.00	100.00
Total	91,963.30	250,852.79

Collections for account of miscellaneous receipts form no part of the working capital of the Panama Canal, since these funds must by law be immediately covered into the United States Treasury and relinquished from control of the Panama Canal. These collections consist mainly of tolls, postal receipts, court fees and fines, and amortization of public works in Panama and Colon.

Owing to the above restrictions these items are segregated from cash and acounts pertaining to appropriated funds available for expenditure by Canal authorities.

TABLE NO. 7.—*Fiscal officers' security deposit accounts, fiscal year 1933*

	Disbursing clerk, Washington, D.C.	Paymaster, Isthmus	Collector, Isthmus	Total
Receipts:				
Cash on hand July 1, 1932	$50,010.25		$497,910.77	$547,921.02
Deposits	14,859.73	$4,632,534.10	23,395,760.63	28,043,154.46
Total cash debits	64,869.98	4,632,534.10	23,893,671.40	28,591,075.48
Disbursements:				
Panama Canal bills	55,844.94		21,514,805.84	21,570,650.78
Individuals and companies			1,882,541.94	1,882,541.94
Refunds	1,055.31		27,210.39	28,265.70
Civil Service retirement funds	7,969.73	338,088.39		346,058.12
Panama Railroad commissary and miscellaneous service		4,260,882.63		4,260,882.63
Cash on hand June 30, 1933		33,563.08	469,113.23	502,676.31
Total cash credits	64,869.98	4,632,534.10	23,893,671.40	28,591,075.48

Transactions by the disbursing clerk, Washington, D.C., consist principally of collections from employees for payment into the Civil Service retirement fund. There are also occasional deposits by individuals and companies guaranteeing the payment of Panama Canal and Panama Railroad Co. bills.

The paymaster's account consists entirely of collections from Panama Canal and Panama Railroad Co. employees for commissary coupon books, miscellaneous sales, and service rendered by the Panama Railroad Co. and the Panama Canal.

In the collector's account are deposited funds by banks, individuals, and companies to guarantee payment of bills rendered by the Panama Canal and the Panama Railroad Co., also deposits to guarantee fulfillment of contracts.

The disbursement shown under "Panama Canal bills", represents the revenue earned by the Panama Canal on bills charged against deposits, principally for tolls and other shipping activities. Payments to individuals and companies represent amounts paid the Panama Railroad Co. covering bills charged against depositors, and "refunds" covers amount refunded to various depositors of the difference between the amount deposited and the charges made against such deposits.

TABLE NO. 8.—*Receipts and disbursements by collector of Canal Zone funds*

FISCAL YEAR 1932		
Cash on hand July 1, 1931		$1,014,113.62
Receipts:		
Clubhouse funds	$466,807.50	
Trust funds	25,692.82	
Money order funds	2,413,474.80	
Interest	34,438.17	
		2,940,413.29
Total		3,954,526.91
Disbursements:		
Clubhouse funds	470,577.49	
Trust funds	36,498.48	
Money order funds	1,637,194.37	
Interest	25,317.51	
		2,169,587.85
Cash on hand June 30, 1932		1,784,939.06
Clubhouse funds	102,661.26	
Trust funds	5,083.80	
Money order funds	1,651,630.58	
Interest	25,382.42	
Postal savings	181.00	
FISCAL YEAR 1933		
Cash on hand July 1, 1932		1,784,939.06
Receipts:		
Clubhouse funds	445,344.40	
Trust funds	21,802.85	
Money order funds	2,595,815.40	
Interest	49,851.79	
		3,112,814.44
Total		4,897,753.50
Disbursements:		
Clubhouse funds	470,169.45	
Trust funds	19,060.10	
Money order funds	2,143,562.84	
Interest	25,321.57	
		2,658,113.96
Cash on hand June 30, 1933		2,239,639.54
Clubhouse funds	77,836.21	
Trust funds	7,826.55	
Money order funds	2,103,883.14	
Interest	49,912.64	
Postal savings	181.00	

TABLE NO. 9.—*Cash receipts and disbursements for account of the United States, fiscal year ended June 30, 1933*

CASH RECEIPTS

	Disbursing clerk, Washington, D.C.	Paymaster, Canal Zone	Collector, Canal Zone	Total, fiscal officers	United States Treasurer	Total
On hand July 1, 1932 by appropriations and funds:						
Maintenance and operation, Panama Canal	$455,862.84	$731,373.72	$19,309.66	$1,206,546.22	$5,662,103.84	$6,868,650.06
Sanitation, Canal Zone, Panama Canal	9,449.74	74,989.11	3,908.91	88,347.76	37,156.19	125,503.95
Civil government, Panama Canal and Canal Zone	1,525.78	59,455.50	1,503.70	62,484.98	176,922.38	239,407.36
Miscellaneous receipts, United States revenues			91,863.30	91,863.30		91,863.30
Special deposits	50,010.25		497,910.77	547,921.02		547,921.02
Total	516,848.61	865,818.33	614,496.34	1,997,163.28	5,876,182.41	7,873,345.69
Appropriations for fiscal year 1933:						
Maintenance and operation, Panama Canal [1]					11,892,511.00	11,892,511.00
Sanitation, Canal Zone, Panama Canal					755,650.00	755,650.00
Civil government, Panama Canal and Canal Zone					1,300,000.00	1,300,000.00
Total					13,948,161.00	13,948,161.00
Transfers between fiscal officers:						
Maintenance and operation, Panama Canal	3,701,500.00	12,922,549.22		16,624,049.22	503,905.01	17,127,954.23
Sanitation, Canal Zone, Panama Canal	135,000.00	1,364,742.08		1,499,742.08	47,272.08	1,547,014.16
Civil government, Panama Canal, and Canal Zone	70,000.00	1,232,507.44		1,302,507.44	15,417.26	1,317,924.70
Total	3,906,500.00	15,519,798.74		19,426,298.74	566,594.35	19,992,893.09
Collections:						
Maintenance and operation, Panama Canal	114,073.96	226,773.93	7,071,280.60	7,412,128.49		7,412,128.49
Sanitation, Canal Zone, Panama Canal	24,170.01	8.89	741,764.10	765,943.00	40,065.75	806,008.75
Civil government, Panama Canal, and Canal Zone	6,921.65	45,175.64	82,924.70	135,021.99		135,021.99
Miscellaneous receipts, United States revenues	327.91	1.98	20,035,929.66	20,036,259.55		20,036,259.55
Special deposits	14,859.73	4,632,534.10	23,395,760.63	28,043,154.46		28,043,154.46
Total	160,353.26	4,904,494.54	51,327,659.69	56,392,507.49	40,065.75	56,432,573.24
Total cash debits	4,538,701.87	21,290,111.61	51,942,156.03	77,815,969.51	20,431,003.51	98,246,973.02

Covered into the United States Treasury, business profits fiscal year 1932: Maintenance and operation, Panama Canal					$506,341.85	$506,341.85
Tolls and other miscellaneous receipts: Miscellaneous receipts, United States revenues	$327.91	$1.97	$19,877,040.18	$19,877,370.06		19,877,370.66
Economy act impoundings:						
Maintenance and operation, Panama Canal					677,386.06	677,386.06
Sanitation, Canal Zone, Panama Canal					63,596.65	63,596.65
Civil government, Panama Canal and Canal Zone					94,644.06	94,644.06
Total economy act impoundings					835,626.77	835,626.77
Total	327.91	1.97	19,877,040.18	19,877,370.06	1,341,968.62	21,219,338.68
Transfers between fiscal officers:						
Maintenance and operation, Panama Canal	503,507.82		6,972,946.41	7,476,454.23	9,651,500.00	17,127,954.23
Sanitation, Canal Zone, Panama Canal	47,272.08		739,742.08	787,014.16	760,000.00	1,547,014.16
Civil government, Panama Canal, and Canal Zone	15,417.26		82,507.44	97,924.70	1,220,000.00	1,317,924.70
Total	566,197.16		7,795,195.93	8,361,393.09	11,631,500.00	19,992,893.09
Disbursements:						
Maintenance and operation, Panama Canal	3,697,752.83	12,631,578.73		16,329,331.56	1,188.91	16,330,520.47
Sanitation, Canal Zone, Panama Canal	114,670.21	1,346,617.51		1,461,287.72	168.76	1,461,456.48
Civil government, Panama Canal, and Canal Zone	62,056.93	1,267,401.88		1,329,458.81	96.00	1,329,554.81
Special deposits	64,869.98	4,598,971.02	23,424,558.17	28,088,399.17		28,088,399.17
Total	3,939,349.95	19,844,569.14	23,424,558.17	47,208,477.26	1,453.67	47,209,930.93
On hand June 30, 1933:						
Maintenance and operation, Panama Canal	70,176.15	1,249,118.14	117,643.85	1,436,938.14	7,222,103.03	8,659,041.17
Sanitation Canal Zone, Panama Canal	6,677.46	93,122.57	5,930.93	105,730.96	56,378.61	162,109.57
Civil government, Panama Canal, and Canal Zone	973.24	69,736.70	1,920.96	72,630.90	177,599.58	250,230.48
Appropriated funds balance	77,826.85	1,411,977.41	125,495.74	1,615,300.00	7,456,081.22	9,071,381.22
Miscellaneous receipts, United States revenues		.01	250,752.78	250,752.79		250,752.79
Special deposits		33,563.08	469,113.23	502,676.31		502,676.31
Total	77,826.85	1,445,540.50	845,361.75	2,368,729.10	7,456,081.22	9,824,810.32
Total cash credits	4,583,701.87	21,290,111.61	51,942,156.03	77,815,969.51	20,431,003.51	98,246,973.02

[1] Includes $2,800,000 special Panama Railroad dividends.

During the current fiscal year the Treasurer of the United States advanced to the fiscal officers of the Panama Canal the sum of $11,631,500, and disbursed directly from the Treasury $1,453.67, a total of $11,632,953.67. Against this amount the fiscal officers of the Panama Canal remitted to the Treasury the sum of $566,594.35 and direct collections by the Treasurer amounted to $40,065.75, a total of $606,660.10, resulting in a net withdrawal of appropriated funds from the United States Treasury amounting to $11,026,293.57 as compared with $10,132,559.65 withdrawn the previous fiscal year.

The sum of $506,341.85, covering business profits for the fiscal year 1932, was transferred from the appropriation for maintenance and operation to miscellaneous receipts, and thereby relinquished from control of the Panama Canal.

Additional detail of collections by the collector on the Isthmus are shown in table no. 30 (not printed), and of special deposit funds in table no. 7.

TABLE NO. 10.—*Accounts receivable*

REGISTERED DURING THE YEAR

	Fiscal year 1932	Fiscal year 1933
Repaid to appropriations:		
Panama Railroad Co	$2,463,021.98	$1,890,573.95
Other departments of the United States	1,750,237.20	1,485,679.95
Individuals and companies	2,842,866.21	3,096,721.58
Total	7,056,125.39	6,472,975.48
Miscellaneous receipts:		
Tolls	20,707,855.99	19,621,210.76
Miscellaneous	1,213.50	1,232.00
Total	20,709,069.49	19,622,442.76
Grand total	27,765,194.88	26,095,418.24
Number of bills registered	40,662	38,244

OUTSTANDING AT END OF YEAR

Audited bills	$557,123.77	$559,543.20
Hospital certificates	25,120.00	24,775.69
Injury compensation	3,240.73	3,218.43
Unredeemed commissary coupons	1.50	31.00
Total	585,486.00	587,568.32

The outstanding balance at the end of the fiscal year includes all accounts due the Panama Canal except items pertaining to miscellaneous receipts (table no. 6) and a few items of utility service, principally for employees, which are not credited to earnings until collected, usually by pay roll deduction.

TABLE NO. 11.—*Material and supplies*

	Fiscal year 1932	Fiscal year 1933
Stock on hand, first of year:		
Balboa store	$2,854,267.19	$2,602,873.37
Medical store	62,489.93	62,729.98
Administration Building store	24,698.92	32,401.85
Paraiso store	554,334.87	600,934.45
Cristobal store	582,421.46	492,002.10
Locks store	606,639.26	622,915.85
Fuel oil plants	96,177.56	41,906.08
Panama Canal Press	79,605.30	79,731.07
Sand and gravel pile	159,990.60	114,801.50
Division stores	197,483.02	242,979.01
Total stock card value	5,218,108.11	4,893,275.26
Reserve for inventory adjustments	262,376.05	320,173.83
Book value of stock on hand	4,955,732.06	4,573,101.43
Receipts of material:		
By purchases for stock	2,899,243.59	3,206,164.56
By purchases for divisions	924,411.45	706,057.19
By manufacture	237,267.30	386,274.60
Total	4,060,922.34	4,298,496.35
Price adjustments, service charges, etc	141,879.84	88,777.20
Book value of receipts	4,202,802.18	4,387,273.55
Total charges to stock	9,158,534.24	8,960,374.98
Issues and sales of material:		
Issues to business divisions	2,493,987.53	2,674,791.23
Issues to Canal divisions	1,166,537.24	1,391,619.37
Variation in division stores	[1] 45,495.99	[1] 97,363.75
Total issues	3,615,028.78	3,969,046.85
Sales	970,404.03	1,030,544.65
Total issues and sales	4,585,432.81	4,999,591.50
Stock on hand, end of year:		
Balboa store	2,602,873.37	2,205,356.31
Medical store	62,729.98	63,877.08
Administration Building store	32,401.85	21,271.72
Paraiso store	600,934.45	566,721.60
Cristobal store	492,002.10	390,656.72
Locks store	622,915.85	583,758.91
Fuel oil plants	41,906.08	84,973.44
Panama Canal Press	79,731.07	59,323.62
Sand and gravel	114,801.50	64,111.30
Division stores	242,979.01	340,342.76
Total stock card value	4,893,275.26	4,380,393.46
Reserve for inventory adjustments	320,173.83	419,609.98
Book value of stock on hand	4,573,101.43	3,960,783.48

[1] Credit.

In the foregoing table all values are stated at stock-card prices which cover the cost of material delivered into general storehouses, except for necessary adjustments due to price averaging of various consignments of the same article, inventory discrepancies, exchange of containers, etc.

Issues to Canal divisions are made at cost, but issues to business divisions and sales to commercial interests are surcharged above the stock-card values shown in the foregoing table to produce the total revenue shown under general storehouses on table no. 26 against gross expenses which include storehouse operations as well as the cost of goods sold.

TABLE NO. 12.—*Work in progress*

	Fiscal year 1932	Fiscal year 1933
Electrical division	$2,554.43	$230.28
Municipal division	6,411.53	5,231.18
Shops and drydocks	381,979.56	45,299.27
Panama Canal Press	3,080.96	1,520.27
Total	394,026.48	52,281.00

This account covers the amounts expended on uncompleted jobs, and will ultimately be cleared to operating expenses of the divisions indicated, with corresponding credits to their revenues after application of authorized surcharge.

TABLE NO. 13.—*Deferred charges*

	Fiscal year 1932	Fiscal year 1933		Fiscal year 1932	Fiscal year 1933
Clubs and playgrounds		$2.00	Motor transportation		$60.68
Health department	$7,219.96	7,356.49	Building repairs and construction	$8,537.58	10,591.03
District quartermaster, Cristobal		1,152.00	Rented buildings		15.24
Port captain, Balboa	1,366.35	1,049.65	District quartermasters' supplies	1,289.39	835.29
Port captain, Cristobal	308.22	308.22	Marine salvage section		9.75
Lighthouse subdivision		32.00	Madden Dam division	122.78	44.19
Pacific locks	11,435.57		Fortifications division	285.10	
Dredging division	51,765.74	59,319.75	Public works, Panama	[1] 7,159.39	12,696.89
General suspense	140.06		Public works, Colon	1,143.44	17,216.86
Electrical division	909.97	4,174.06			
Municipal division	18.80				
Shops and drydocks	9,321.19	62,007.92	Total	86,704.76	176,872.02

[1] Credit.

This account covers expenses incurred for account of divisions indicated, but which are not chargeable to operating accounts of the current year. These amounts are cleared as soon as values are consumed.

TABLE NO. 14.—*Capital investment*

Appropriations for Canal construction to June 30, 1921 (details in Annual Report for 1924, table no. 3)	$386,910,301.00
Deduct value of capital stock of the Panama Railroad Co	7,000,000.00
Net construction appropriations	379,910,301.00
Annual payments to the Republic of Panama, 1913 to 1921 (State Department)	2,250,000.00
Maintenance funds diverted to construction, 1922 to June 30, 1933	13,387,397.80
Total cash investment	395,547,698.80
Interest on construction funds (compounded annually) 1904 to 1921	143,652,360.43
Total capital investment	539,200,059.23

The capital investment account covers the following assets as of June 30, 1933, shown in comparison with assets on June 30, 1932:

	June 30, 1932	June 30, 1933
Canal fixed property and equipment (table no. 2)	$489,714,854.35	$494,168,312.00
Administrative and civil property (table no. 3)	11,098,471.93	12,017,208.41
Business fixed property and equipment (table no. 4)	26,486,679.88	27,264,922.75
Public works, Republic of Panama (table no. 5)	1,431,003.31	1,374,616.07
Proportion of working capital (table no. 23)	4,375,000.00	4,375,000.00
Total capital assets	533,106,009.47	539,200,059.23

The construction period of the Panama Canal is considered as extending to the close of the fiscal year 1921, and computed interest during this period has been charged to capital account.

The capital investment of $539,200,059.23 at the close of 1933 is considered as representing a perpetual bond issue with interest at 3 percent, except that sales and final withdrawals of capital assets will be deducted, and current additions to capital assets will be added to the capital investment by a diversion from maintenance and operation appropriations, but no reduction in bonded liability will be made for accrued depreciation of capital assets while in service.

Interest on the capital investment from 1922 to date, amounting to $190,143,252.08, is considered as a charge to operating expenses, and while this charge does not appear on the balance sheet a statement of such interest compared with net revenues, by years, is shown on table no. 21. Interest for the current fiscal year is based upon the capital investment of $533,106,009.47, as of June 30, 1932, and amounts to $15,993,180.28. Interest for the ensuing fiscal year will be based upon the capital investment of $539,200,059.23, as of June 30, 1933.

TABLE NO. 15.—*Outstanding accounts payable*

	Fiscal year 1932	Fiscal year 1933
United States invoices	$62,311.41	[1] $31,248.09
Isthmus vouchers	225,429.42	296,047.07
Current pay rolls	1,035,573.89	923,527.47
Unpaid salaries and wages	26,878.36	27,967.49
Drums, carboys, and reels	5,624.12	3,709.12
Local purchases	[1] 2,197.08	[1] 3,575.56
Total	1,353,620.12	1,216,427.50

[1] Denotes debit.

The above table covers all current obligations of the Panama Canal except deposits to guarantee payment of bills which are covered by table no. 7, security deposits, and table no. 8, trust funds.

The debit balance of $31,248.09 as shown under United States invoices is due to the payment in the United States to individuals and companies, of approximately $80,000 for supplies purchased but not yet taken into the storehouses on the Isthmus.

TABLE NO. 16.—*Reserve for replacements (funded)*

	Fiscal year 1932	Fiscal year 1933
Canal equipment:		
Tugs	$749,811.38	$668,090.38
Supply boats	37,131.60	39,531.60
Launches	113,619.65	129,233.78
Dredges	177,475.79	276,295.79
Lighters and scows	370,356.99	399,013.86
Craneboats	15,680.00	17,584.71
Barges	83,882.35	103,639.83
Ferryboats	9,000.00	14,709.49
Automobiles	198.71	
Excavators	13,896.00	15,633.00
Cranes	3,294.85	4,363.45
Reserve equipment	201.90	81.82
Total canal equipment	1,574,549.22	1,668,177.71
Business fixed property:		
Electric light and power system	423,205.20	400,564.90
Electric work	138.05	3,831.74
Water system	285,648.36	290,596.30
Shops and drydocks	49,166.67	264,853.42
Fuel-oil plants	94,383.58	436,177.11
General storehouses		24,000.00
Motor transportation	4,339.94	7,009.62
Motor car repair shop	11,314.69	12,863.95
Building repairs and construction	19,720.23	8,487.88
Panama Canal Press	7,532.00	10,760.00
Gold quarters	186,303.67	195,001.85
Rented buildings	74,910.93	81,184.97
Hotel Tivoli	48,003.07	67,629.62
Colliers	72,145.46	72,145.46
Coal barges		50,000.00
Total business fixed property	1,276,811.85	1,925,106.82
Business equipment:		
Electric light and power system	6,211.68	12,017.77
Electric work	19,655.76	27,571.59
Telephone, telegraph, and signal work	10,113.99	13,148.51
Water system	18,176.28	20,959.44
Municipal work	92,365.69	103,594.48
Shops and drydocks	32,858.41	48,179.73
Fuel-oil plants	5,657.33	6,184.71
General storehouses		15,482.71
Motor transportation	42,090.47	98,762.74
Motor car repair shop	[1] 1,362.44	[1] 4,123.18
Building repairs and construction	29,953.65	40,004.37
Panama Canal Press	31,118.45	35,384.07
Rented buildings	18,117.64	1,696.94
District quartermasters' supplies	6,435.88	5,631.76
Hotel Tivoli	34,881.95	44,539.07
Farm bureau	1,728.20	2,758.80
Marine salvage section	16,762.99	15,728.79
Total business equipment	364,765.93	487,522.30
Total business fixed property and equipment	1,641,577.78	2,412,629.12
Total reserve for replacements	3,216,127.00	4,080,806.83

[1] Denotes debit.

The foregoing table covers the amount of funds available for the replacement of Canal equipment and business fixed property and equipment. During the year there was added to the replacement reserve by charges against operations and from proceeds of sales, approximately $1,155,000. There was also approximately $457,000 transferred from repair reserves to replacement reserves.

There were used from this replacement reserve the following amounts in round figures, craneboat *Atlas* (part) $150,000; launches $13,400; ferryboat equipment $6,300; supervisory control for two electrical division substations $55,200; electrification of restaurants $41,800; relocation and improvement Gatun substation (part)

$39,100; other electrical division lines and improvements $8,600; electric ranges and water heaters $18,500; water system extensions and replacements $15,800; water tank $28,000; fuel oil line extensions and replacements $77,000; motor-vehicle replacements $21,200; quarters $98,400; alterations and improvements to quarters $23,600; restaurant for alien employees $12,200; mechanical division shop improvements $15,400; miscellaneous small buildings $16,900; miscellaneous machinery and tools $97,800; and other miscellaneous business division improvements $8,100; leaving a balance at the end of the fiscal year of $4,080,807.

Against the combined reserves available for repairs and replacements at the end of June 1933, amounting to $4,866,711.70, as shown in the foregoing table and in table no. 17, the following amounts have already been obligated; craneboat (to complete) $219,700; equipment for hydraulic grader $30,000; relocation and improvement Gatun substation (to complete) $100,000; underground high tension cable around oil tank farm $15,000; electric ranges and water heaters $25,500; Cristobal shop improvements $240,000; repairs to docks $20,300; motor-vehicle replacements $12,000; quarters $152,700; garages $12,500; miscellaneous business improvements $7,000; and miscellaneous business equipment $56,900; total of $891,600.

TABLE NO. 17.—*Reserve for repairs (funded)*

	Fiscal year 1932	Fiscal year 1933
Canal equipment:		
Tugs	$131,991.07	$64,515.33
Supply boats	[1] 7,680.04	[1] 8,254.15
Launches	70,704.85	78,753.69
Dredges	22,968.68	1,761.80
Lighters and scows	60,578.31	159,102.88
Craneboats	9,423.45	17,926.92
Barges	[1] 2,894.78	19,487.37
Ferry boats	[1] 490.52	4,985.31
Total equipment	284,601.02	338,279.15
Business fixed property:		
Electric light and power system	44,872.62	57,625.03
Electric work	138.05	509.57
Shops and dry docks	205,659.61	48,085.70
Wharves and piers	8,700.00	20,349.25
Fuel oil plants	402,318.17	110,395.83
General storehouses	8,510.67	21,548.52
Panama Canal Press	1,996.02	2,964.40
Total business fixed property	672,195.14	261,478.30
Business equipment:		
Electric work	100.00	264.89
Municipal work	26,097.50	31,740.23
Shops and drydocks	94,291.98	85,991.78
Motor transportation		10,000.00
Building repairs and construction	11,882.85	10,787.96
Panama Canal Press	1,058.66	1,512.21
Farm bureau	211.86	526.09
Marine salvage section	56,341.77	45,324.26
Total business equipment	189,984.62	186,147.42
Total business fixed property and equipment	862,179.76	447,625.72
Total reserve for repairs	1,146,780.78	785,904.87

[1] Denotes debit.

On July 1, 1932, the reserve for extraordinary repairs amounted to $1,146,780.78, to which was added during the year $857,300. Expenditures of $761,000 in round figures, were charged against this reserve including $114,800 for improvements to Cristobal shops. There was $457,000 transferred to replacement reserves, leaving a balance on June 30, 1933, of $785,904.87. (For obligations against the combined balance of replacement and repair reserves, see remarks under table no. 16).

TABLE NO. 18.—*Operating reserve (funded)*

	Fiscal year 1932	Fiscal year 1933
Electrical division	$122,076.51	$130,627.85
Municipal division	49,624.49	59,072.35
Shops and drydocks	194,649.77	203,434.96
Building repairs and construction	39,343.77	34,211.79
Madden Dam division	13,403.89	27,807.92
Fortifications divisions	19,933.76	18,855.43
Total	439,032.19	474,010.30

The foregoing table represents the amount of cash held in reserve for vacation pay due employees of the principal business divisions. This fund is created by adding a percentage to the direct gold labor charges for work performed by the division listed above to the credit of this account. The account is debited with the amount paid to employees when leave is actually taken or when leaving the service.

TABLE NO. 19.—*Deferred credits*

	Fiscal year 1932	Fiscal year 1933
Executive offices	$1,420.00	
Clubs and playgrounds	1,000.00	
Accounting office	1,920.00	$650.00
Collector's office	1,085.00	
Civil government	22,042.63	1,602.63
Health department	42,788.18	21,813.88
Surveys	500.00	
Port captain, Cristobal	2,560.00	
Lighthouse subdivision	5,000.00	
Pacific locks	4,000.00	
Atlantic locks	3,100.00	
Gatun Dam	8,841.00	
Dredging division	33,397.84	
General suspense	1,604.12	1,695.96
Electrical division	[1] 1,617.81	
Municipal division	77,541.44	44,292.25
Shops and drydocks	38,130.83	48,642.94
General storehouses	4,810.41	6,574.81
Building repairs and construction	9,912.76	12,268.01
Panama Canal Press	197.92	
Gold quarters	5,000.00	
Silver quarters	24,500.00	
Farm bureau	6,634.60	8,348.27
Nautical charts and publications	1,410.28	1,381.42
Madden Dam division	48,521.39	213,303.19
Contingencies, maintenance and operation	45,535.86	45,510.04
Contingencies, sanitation	229.79	640.19
Contingencies, civil government	149.07	148.07
Total	390,215.31	406,871.66

[1] Denotes debit.

This account covers expenses accrued or estimated which have been charged to operating accounts, but for which it was impracticable to institute corresponding payments at the close of the accounting period. These amounts are cleared as soon as corresponding charges are passed for payment or contingent expenses arise.

TABLE NO. 20.—*Consolidated statement of income, expenses and net revenues*

	Fiscal year 1932	Fiscal year 1933
Canal operations:		
Canal revenues:		
Tolls	$20,706,568.49	$19,621,158.61
Postal receipts	241,447.36	238,610.78
Other miscellaneous receipts	85,996.87	71,403.38
Total Canal revenues (table 24)	21,034,012.72	19,931,172.77
Canal earnings (table 25)	2,871,176.72	2,702,673.34
Total revenues	23,905,189.44	22,633,846.11
Canal expenses:		
Executive department	444,047.92	395,318.12
Clubs and playgrounds	228,377.05	217,176.02
Accounting department	572,012.96	490,224.38
Washington office	284,674.21	256,596.42
Civil government	1,383,180.97	1,235,360.82
Health department	1,648,251.22	1,491,665.10
Office engineer	124,663.11	110,017.90
Section of surveys	107,166.34	97,071.05
Public buildings and grounds	375,938.27	341,547.32
Marine division	1,455,968.59	1,243,245.24
Locks, operation and maintenance	1,445,652.29	1,081,957.26
Locks, overhaul		822,365.39
Gatun Dam and spillway	85,494.78	59,312.72
Dredging division	2,502,505.42	2,015,666.86
Municipal expenses	224,887.39	242,157.77
Proportion of general stores expense	300,000.00	279,916.00
Railroad tracks maintenance	23,235.37	19,000.15
Recruiting and repatriating employees	11,202.30	10,953.12
Transportation of employees on Isthmus	120,000.00	120,000.00
Maintenance of laborers' quarters	94,738.03	67,928.94
Damage to vessels	21,521.41	4,239.50
Miscellaneous general expense	246.53	
Depreciation on fixed property	1,006,624.40	1,006,625.28
Annual payment to Republic of Panama	250,000.00	250,000.00
Total Canal expenses	12,710,388.56	11,858,345.36
Net Canal revenues (table 25)	11,194,800.88	10,775,500.75
Fixed capital charge	15,145,326.71	15,224,192.20
Surplus	[1] 3,950,525.83	[1] 4,448,691.45
Business operations:		
Business revenues	17,530,214.63	16,583,950.43
Business expenses	16,973,119.19	15,448,241.81
Net business revenues (table 26)	557,095.44	1,135,708.62
Fixed capital charge	769,051.86	768,988.08
Surplus	[1] 211,956.42	366,720.54
Combined Canal and business operations:		
Revenues	41,435,404.07	39,217,796.54
Expenses	29,683,507.75	27,306,587.17
Net revenues	11,751,896.32	11,911,209.37
Fixed capital charge at 3 percent	15,914,378.57	15,993,180.28
Surplus	[1] 4,162,482.25	[1] 4,081,970.91
Capital investment (table 14)	530,479,285.72	533,106,009.47
Combined net revenues	11,751,896.32	11,911,209.37
Percent of capital return	2.22	2.23

[1] Deficit.

A summary comparison of net revenues and capital interest, by years, from 1922 to date, is shown on table no. 21, following, together with a brief description of accounting policy governing charges to operating expenses.

TABLE NO. 21.—*Revenues, expenses, and computed surplus*

Fiscal year	Tolls	Postal and civil revenues	Business profits	Total revenues	Net appropriation expenses [1]	Net revenues	Capital interest 3 percent [2]	Computed surplus
1914 to 1921	$44, 565, 500. 98	$1, 420, 566. 05	$1, 100, 309. 54	$47, 086, 376. 57	$45, 986, 067. 03	$1, 100, 309. 54		$1, 100, 309. 54
1922	11, 193, 383. 47	192, 208. 85	323, 259. 16	11, 708, 851. 48	8, 169, 017. 63	3, 539, 833. 85	$15, 759, 105. 50	[3] 12, 219, 271. 65
1923	17, 507, 630. 52	184, 213. 54	1, 140, 642. 50	18, 832, 486. 56	7, 940, 777. 56	10, 891, 709. 00	15, 759, 105. 50	[3] 4, 867, 396. 50
1924	24, 289, 603. 16	392, 250. 73	901, 624. 12	25, 583, 478. 01	8, 623, 905. 39	16, 959, 572. 62	15, 759, 105. 50	1, 200, 467. 12
1925	21, 374, 664. 12	207, 954. 04	765, 916. 85	22, 348, 535. 01	8, 366, 693. 44	13, 981, 841. 57	15, 759, 105. 50	[3] 1, 777, 263. 93
1926	22, 927, 456. 03	217, 580. 50	841, 310. 29	23, 986, 446. 82	8, 243, 468. 47	15, 742, 978. 35	15, 796, 305. 50	[3] 53, 327. 15
1927	24, 217, 185. 32	391, 623. 50	876, 536. 80	25, 485, 345. 62	9, 247, 715. 02	16, 237, 630. 60	15, 830, 655. 50	406, 975. 10
1928	26, 943, 513. 11	232, 532. 57	736, 719. 43	27, 912, 765. 11	9, 201, 200. 82	18, 711, 564. 29	15, 845, 453. 84	2, 866, 110. 45
1929	27, 123, 534. 33	243, 391. 39	737, 850. 26	28, 104, 775. 98	9, 887, 150. 71	18, 217, 625. 27	15, 875, 152. 13	2, 342, 473. 14
1930	27, 077, 117. 36	349, 255. 35	760, 971. 66	28, 187, 344. 37	9, 593, 920. 93	18, 593, 423. 44	15, 900, 652. 13	2, 692, 771. 31
1931	24, 644, 550. 39	346, 030. 35	562, 764. 17	25, 553, 344. 91	10, 393, 353. 53	15, 159, 991. 38	15, 951, 052. 13	[3] 791, 060. 75
1932	20, 706, 568. 49	327, 444. 23	557, 095. 44	21, 591, 108. 16	9, 839, 211. 84	11, 751, 896. 32	15, 914, 378. 57	[3] 4, 162, 482. 25
1933	19, 621, 158. 61	310, 014. 16	1, 135, 708. 62	21, 066, 881. 39	9, 155, 672. 02	11, 911, 209. 37	15, 993, 180. 28	[3] 4, 081, 970. 91
Total	312, 191, 865. 89	4, 815, 165. 26	10, 440, 708. 84	327, 447, 739. 99	154, 648, 154. 39	172, 799, 585. 60	190, 143, 252. 08	[3] 17, 343, 666. 48

[1] After deduction of Canal earnings repaid to appropriations.

[2] Interest prior to 1922 is included in capital investment account.

[3] Deficits.

The purpose of this table is to present a statistical summary of net earnings of the Panama Canal on a basis reasonably comparable with corporate practice, but it is obvious that the cost of Canal construction and development could not have been financed from corporate funds on an interest basis as low as 3 percent, although this rate is considered reasonable for Government borrowings over an indefinite period.

Whatever difference exists in interest rates between Government and corporate financing must necessarily be considered as a charge to the value of the Canal as an instrument of national defense, because the use of an interest rate appreciably higher than 3 percent would increase the capital investment to a figure so high that it would preclude reasonable probability that Canal earnings could ever overtake the compounding interest on operating deficits.

The date determined for transferring the interest burden from capital to operating account, fixed at the close of the fiscal year 1921, is necessarily arbitrary, but represents a concensus of competent opinion. Interest chargeable to operations is not included on the balance sheet, and no interest charge against the Canal is actually made by the United States Treasury.

Total revenues on the foregoing statement represent receipts which must be covered into the United States Treasury and relinquished from control of the Panama Canal. Earnings repayable to Canal appropriations, and reexpendable by the Canal, are deducted from gross operating expenditures, in order to present a comparison of funds covered into the Treasury with funds chargeable to operating account, exclusive of capital additions.

Operating expenses include depreciation charges based upon the estimated life of plants and equipment; and also a depreciation charge of approximately $1,000,000 per year on depreciable items of general property of an undetermined life. While this latter amount is small in comparison with capital values, the greater portion of Canal construction costs cover waterways and harbors which are in the nature of geographical changes and which do not depreciate; in fact, constant dredging operations, the cost of which is charged to current expenses, are gradually deepening, straightening, and widening Canal channels and basins.

The absence of tax charges, ordinarily included in corporate expenses, is compensated for by the inclusion in Canal operating accounts of the direct costs of civil government, health, and welfare activities. Neither capital nor operating expenses of the Panama Canal include the cost of the military and naval establishments on the Isthmus; however, all important exchanges of services with these interests are covered by cash settlements, or reciprocal allowances.

While exact reconciliations with corporate practice are manifestly impossible, it is believed that the accounting procedure established compensates for major differences, and that the net results shown in the foregoing tabulation afford a reasonably accurate statement of Canal operations on the basis of a public utility.

TABLE NO. 22.—*Capital refundments*

MISCELLANEOUS RECEIPTS COVERED INTO THE UNITED STATES TREASURY

Fiscal year	Tolls	Postal receipts	Taxes, fees, fines, etc.	Business profits	Miscellaneous [1]	Total
1922	$11, 205, 886. 64	$117, 047. 24	$45, 201. 62	$621, 272. 19	$60, 000. 00	$12, 049, 407. 69
1923	17, 228, 097. 42	117, 173. 59	45, 846. 19	323, 259. 16	153, 898. 37	17, 868, 274. 73
1924	24, 486, 652. 08	119, 364. 27	57, 649. 31	1, 140, 642. 50	270, 807. 97	26, 074, 516. 13
1925	21, 399, 629. 39	136, 032. 67	56, 506. 22	901, 624. 12	55, 286. 36	22, 549, 078. 76
1926	22, 920, 422. 67	142, 854. 91	63, 433. 56	765, 916. 85	49, 177. 00	23, 941, 804. 99
1927	24, 239, 775. 87	144, 542. 94	67, 601. 53	841, 310. 29	251, 473. 37	25, 544, 704. 00
1928	26, 955, 647. 14	147, 502. 27	73, 118. 06	876, 536. 80	81, 541. 51	28, 134, 345. 78
1929	27, 054, 536. 55	162, 590. 89	72, 651. 38	736, 719. 43	104, 948. 94	28, 131, 447. 19
1930	27, 121, 831. 94	261, 183. 41	76, 986. 81	737, 850. 26	75, 227. 77	28, 273, 080. 19
1931	24, 670, 281. 59	257, 061. 52	80, 053. 25	760, 971. 66	64, 300. 78	25, 832, 668. 80
1932	20, 776, 860. 08	241, 447. 36	75, 319. 54	562, 764. 17	92, 520. 30	21, 748, 911. 45
1933	19, 464, 173. 04	236, 572. 53	71, 207. 83	557, 095. 44	890, 289. 84	21, 219, 338. 68
Total	267, 523, 794. 41	2, 083, 373. 60	784, 975. 30	8, 825, 962. 87	2, 149, 472. 21	281, 367, 578. 39

TOTAL OPERATING APPROPRIATIONS

Fiscal year	Maintenance and operation	Sanitation	Civil government	Increase of of compensation	Annual payment to Panama	Total
1922	$7, 250, 000. 00	$850, 000. 00	$900, 000. 00	$21, 500. 00	$250, 000. 00	$9, 271, 500. 00
1923	2, 659, 434. 00	525, 000. 00	930, 000. 00	16, 800. 00	250, 000. 00	4, 381, 234. 00
1924	5, 079, 683. 00	575, 000. 00	930, 000. 00	17, 520. 00	250, 000. 00	6, 852, 203. 00
1925	5, 851, 210. 00	586, 266. 00	991, 670. 00		250, 000. 00	7, 679, 146. 00
1926	7, 140, 000. 00	653, 216. 00	942, 150. 00		250, 000. 00	8, 985, 366. 00
1927	5, 986, 094. 00	670, 000. 00	999, 980. 00		250, 000. 00	7, 906, 074. 00
1928	5. 830, 000. 00	670, 000. 00	1, 100, 000. 00		250, 000. 00	7, 850, 000. 00
1929	6, 832, 000. 00	722, 000. 00	1, 172, 400. 00		250, 000. 00	8, 976, 400. 00
1930	8, 000, 000. 00	820, 000. 00	1, 201, 000. 00		250, 000. 00	10, 271, 000. 00
1931	10, 162, 470. 00	753, 900. 00	1, 295, 190. 00		250, 000. 00	12, 461, 560. 00
1932	9, 359, 808. 00	782, 189. 00	1, 351, 689. 00		250, 000. 00	11, 743, 686. 00
1933	11, 891, 011. 00	755, 650. 00	1, 300, 000. 00		250, 000. 00	14, 196, 661. 00
Total	86, 041, 710. 00	8, 363, 221. 00	13, 114, 079. 00	55, 820. 00	3, 000, 000. 00	110, 574, 830. 00
Net deposits						170, 792, 748. 39
Diversion of operating appropriation to capital investment (table no. 14)						13, 387, 397. 80
Net capital refundments from operations						184, 180, 146. 19

[1] Includes amortization, public works, Panama and Colon; bank interest; sale of Government property, etc. Also Economy Act impoundings amounting to $835,626.77.

The balance in capital refundment account measures the difference between Canal revenues covered into the United States Treasury as miscellaneous receipts from July 1, 1921, and the amounts appropriated for maintenance and operation. Since 1921 no separate appropriations have been made for construction purposes, but such items have been included in the regular appropriations for maintenance and operation of the Panama Canal. Amounts expended for construction have been deducted in the foregoing table and transferred to capital investment account (table no. 14).

Although the foregoing table shows a net cash refundment of $184,180,146.19 such refundment is not deductible from capital investment, which is considered as measuring the value of the Panama Canal as an instrument of public utility upon which a perpetual interest return should be earned; furthermore, interest on the capital investment chargeable to operating account is not included in cash transactions with the United States Treasury. Capital interest at 3 percent from 1922 to 1933, chargeable to operating account, would have amounted to $190,143,252.08, as set forth in table no. 21. Had the United States Treasury actually made this interest charge against the Canal the capital refundment balance indicated above would have been extinguished.

Miscellaneous receipts deposited in the United States Treasury prior to 1922 have been applied to equalize appropriations for operation and working capital.

TABLE NO. 23.—*Balance of revenues and refundments*

DEBITS	
Revenue due United States Treasury (table no. 6)	$250, 852. 79
Appropriated cash in United States Treasury (table no. 9)	7, 456, 081. 22
Appropriated cash with fiscal officers (table no. 9)	1, 615, 300. 00
Accounts receivable (table no. 10)	587, 568. 32
Stores (table no. 11)	3, 960, 783. 48
Work in progress (table no. 12)	52, 281. 00
Deferred charges (table no. 13)	176, 872. 02
Total debits	14, 099, 738. 83
CREDITS	
Accounts payable (table no. 15)	1, 216, 427. 50
Reserve for replacements (table no. 16)	4, 080, 806. 83
Reserve for repairs (table no. 17)	785, 904. 87
Operating reserve (table no. 18)	474, 010. 30
Deferred credits (table no. 19)	406, 871. 66
Total credits	6, 964, 021. 16
Net current accounts	7, 135, 717. 67
Less proportion under capital investment (table no. 14)	4, 375, 000. 00
Balance	2, 760, 717. 67

A permanent revolving fund of $4,375,000 is retained by the Panama Canal for working capital, and is credited to capital investment account in addition to funds used for construction and equipment, the total constituting the base for capital interest computations. Net working capital in excess of the revolving fund is considered as a temporary advance of Treasury funds, and the corresponding working capital investments are in constant process of accrual and liquidation for account of the United States Treasury.

TABLE NO. 24.—*Canal revenues*

	Fiscal year 1932	Fiscal year 1933
Tolls	$20,706,568.49	$19,621,158.61
Postal receipts	241,447.36	238,610.78
Licenses, fees, fines, etc	75,319.54	71,047.89
Interest	10,062.13	25.60
Miscellaneous	615.20	329.89
Total	21,034,012.72	19,931,172.77

The revenues shown in the above table are exclusive of the net profits from business operations shown in table no. 26, which will be covered into the United States Treasury as miscellaneous receipts, and the earnings shown in table no. 25, which are repaid to appropriations.

TABLE NO. 25.—*Canal earnings, expenses, and net revenues*

	Expenses	Earnings	Net expenses
Executive department:			
Executive offices	$395,318.12	$137,501.39	$257,816.73
Clubs and playgrounds	217,176.02	156,467.02	60,709.00
Total	612,494.14	293,968.41	318,525.73
Accounting department:			
Accounting office	401,608.52	300,604.40	101,004.12
Paymaster's office	43,451.37	30,654.48	12,796.89
Collector's office	45,164.49	35,673.00	9,491.49
Total	490,224.38	366,931.88	123,292.50
Washington office	256,596.42	40,493.87	216,102.55
Civil government:			
Civil affairs	21,183.54	4.00	21,179.54
Customs	26,433.72	300.00	26,133.72
Postal service	179,802.08	9,779.68	170,022.40
Division of schools	410,783.13	18,251.61	392,531.52
Fire protection	122,337.93	61.66	122,276.27
Police section	409,734.69	60,508.10	349,226.59
District court	27,749.76		27,749.76
District attorney	12,225.04		12,225.04
Marshal	9,029.07		9,029.07
Magistrates' courts	16,065.86		16,065.86
Codification, Canal Zone Laws	16.00		16.00
Total	1,235,360.82	88,905.05	1,146,455.77
Health department:			
Chief health office	26,275.57		26,275.57
Gorgas Hospital	623,452.28	348,832.71	274,619.57
Colon Hospital	134,432.93	85,362.22	49,070.71
Corozal Hospital	163,578.17	182,421.55	[1] 18,843.38
Palo Seco Colony	38,427.41	24,486.00	13,941.41
Line dispensaries	84,099.66	26,706.76	57,392.90
Medical store	6,375.95		6,375.95
Madden Dam dispensary	11,668.22	11,668.22	
Quarantine service	65,783.81	17,537.15	48,246.66
Sanitation, Panama	41,083.47	8,492.44	32,591.03
Sanitation, Colon	22,135.63	2,507.51	19,628.12
Sanitation, Canal Zone	139,679.13	48,620.32	91,058.81
Street cleaning and garbage collection, Panama	80,965.09	65,115.02	15,850.07
Street cleaning and garbage collection, Colon	53,707.78	45,135.20	8,572.58
Total	1,491,665.10	866,885.10	624,780.00
Technical divisions:			
Office engineer	110,017.90	91,806.85	18,211.05
Surveys	97,071.05	29,900.99	67,170.06
Total	207,088.95	121,707.84	85,381.11
Public buildings and grounds:			
Chief quartermaster's office	37,426.65	32,291.00	5,135.65
District quartermaster, Balboa	159,844.67	49,660.77	110,183.90
District quartermaster, Pedro Miguel	42,943.83	35,099.56	7,844.27
District quartermaster, Gatun	24,471.48	19,585.98	4,885.50
District quartermaster, Cristobal	76,860.69	28,328.40	48,532.29
Total	341,547.32	164,965.71	176,581.61

TABLE No. 25.—*Canal earnings, expenses, and net revenues*—Continued

	Expenses	Earnings	Net expenses
Marine division:			
Marine superintendent	$13,732.20	$1,193.35	$12,538.85
Port captain, Balboa:			
General	104,722.49	5,860.67	98,861.82
Admeasurement of vessels	20,548.38	430.00	20,118.38
Pilotage	143,630.70	67,995.40	75,635.30
Handling lines	98,530.80	100,460.00	[1] 1,929.20
Tugs	92,941.55	54,751.25	38,190.30
Launches	83,073.95	58,925.50	24,148.45
Port captain, Cristobal:			
General	55,199.83	132.50	55,067.33
Admeasurement of vessels	24,790.93	900.00	23,890.93
Pilotage	165,935.64	170,616.00	[1] 4,680.36
Handling lines	97,965.04	105,618.00	[1] 7,652.96
Tugs	115,244.29	87,726.75	27,517.54
Launches	55,824.73	52,837.50	2,987.23
Aids to navigation	171,104.71	11,085.70	160,019.01
Total	1,243,245.24	718,532.62	524,712.62
Locks operation and maintenance:			
Pacific locks:			
Miraflores Locks	413,290.93	72.00	413,218.93
Pedro Miguel Locks	272,232.02	60.00	272,172.02
Total	685,522.95	132.00	685,390.95
Quadrennial overhaul	822,365.39		822,365.39
Total Pacific locks	1,507,888.34	132.00	1,507,756.34
Atlantic locks:			
Gatun Locks	396,434.31	309.00	396,125.31
Total	1,904,322.65	441.00	1,903,881.65
Gatun Dam and spillway:			
Gatun Dam	55,048.14	10,456.91	44,591.23
Gatun spillway	4,264.58		4,264.58
Total	59,312.72	10,456.91	48,855.81
Dredging division:			
Atlantic entrance	110,250.21		110,250.21
Gatun Lake	7,084.78		7,084.78
Gaillard Cut	953,893.69		953,893.69
Miraflores Lake	78,619.36		78,619.36
Pacific entrance	644,023.94		644,023.94
Cristobal Harbor	213.76		213.76
Balboa Harbor	111,663.20		111,663.20
Removal of floating obstructions	40,809.95		40,809.95
Floating cranes, maintenance	44,477.44		44,477.44
Dredging division work	24,630.53	29,384.95	[1] 4,754.42
Total	2,015,666.86	29,384.95	1,986,281.91
Municipal expenses:			
Street lighting	18,278.89		18,278.89
Water for municipal purposes	23,400.00		23,400.00
Roads, streets, and sidewalks	119,684.45		119,684.45
Storm sewers	9,123.58		9,123.58
Thatcher Ferry	71,670.85		71,670.85
Total	242,157.77		242,157.77
Miscellaneous general expenses:			
Proportion of general stores expense	279,916.00		279,916.00
Railroad tracks, maintenance	19,000.15		19,000.15
Recruiting and repatriating employees	10,953.12		10,953.12
Transportation of employees on Isthmus	120,000.00		120,000.00
Maintenance of laborers' quarters	67,928.94		67,928.94
Damage to vessels in Canal	424.50		424.50
Damage to vessels in locks	3,815.00		3,815.00
Depreciation of fixed property	1,006,625.28		1,006,625.28
Annual payment to the Republic of Panama	250,000.00		250,000.00
Total	1,758,662.99		1,758,662.99
Net Canal expenses	11,858,345.36	2,702,673.34	9,155,672.02

SUMMARY

Canal revenues (table no. 24)	$19,931,172.77
Net Canal expenses	9,155,672.02
Net Canal revenues	10,775,500.75

[1] Earnings exceed expenses.

The earnings of the divisions engaged in the transiting of vessels through the Canal, as well as earnings of sanitation and civil government divisions, are deducted from gross expenses to arrive at the net expenditures from Canal appropriations, which in turn are deducted from Canal revenues to arrive at net Canal revenues, exclusive of business division profits.

Earnings of the executive offices and accounting department represent principally a proportional charge against business divisions of the Panama Canal and the Panama Railroad Co. Business divisions are reimbursed for this proportional expense by adding a surcharge to the direct cost on all work performed. The Panama Railroad's proportion is distributed to the various units of that organization.

The Government's contribution to the operation and maintenance of clubs and playgrounds is $60,709. All expense in excess of this amount is paid from receipts and profits from the operation of the clubhouses.

The earnings of the Washington office include $40,000 charged against business storehouse operations to cover a proportional part of the cost of purchasing, inspection, and handling of material used by business divisions or sold to outside interests, which expense is covered through surcharges added to the price of material.

TABLE NO. 26.—*Business expenses, revenues, and profit and loss*

	Expenses	Revenues	Profit or loss
Electric light and power system	$488,080.51	$921,212.40	$433,131.89
Electric work	585,429.26	628,915.35	43,486.09
Telephone, telegraph, and signal work	154,745.07	167,449.31	12,704.24
Water system	439,836.91	503,954.63	64,117.72
Municipal work	1,183,919.04	1,260,883.46	76,964.42
Shops and drydocks	2,760,126.76	2,935,670.33	175,543.57
Wharves and piers	50,128.49	50,412.40	283.91
Fuel-oil plants	556,409.37	568,947.97	12,538.60
General storehouses	4,569,174.91	4,659,078.31	89,903.40
Motor transportation	470,160.01	497,981.94	27,821.93
Motor-car repair shop	187,923.78	204,005.74	16,081.96
Building repairs and construction	1,371,826.73	1,451,487.87	79,661.14
Panama Canal Press	178,812.22	199,821.65	21,009.43
Gold quarters	481,366.53	504,030.63	22,664.10
Silver quarters	233,940.31	233,940.31	
Rented buildings	55,094.46	89,525.53	34,431.07
District quartermaster's supplies	217,563.78	230,766.29	13,202.51
Hotel Tivoli	30,000.00	30,000.00	
Farm bureau	19,439.19	20,292.97	853.78
Marine salvage section	74,922.07	16,617.63	[1] 58,304.44
Nautical charts and publications	1,182.64	1,977.45	794.81
Sand and gravel	68,690.85	82,350.20	13,659.35
Madden Dam division	667,997.11	667,997.11	
Fortifications division	151,484.45	157,944.05	6,459.60
Public works, Panama	292,628.53	321,644.65	29,016.12
Public works, Colon	157,358.83	177,042.25	19,683.42
Total	15,448,241.81	16,583,950.43	1,135,708.62

[1] Denotes loss.

The profit on business operations for the fiscal year 1932 amounted to $557,095.44 compared with $1,135,708.62 shown in the foregoing table.

Profits on public works, Panama and Colon, amounting to $48,699.54, also economy act impoundings amounting to $475,585.34

have been currently reported for coverage into general funds of the United States Treasury. The balance of the total profits, amounting to $611,423.74 will be immediately covered into the Treasury as miscellaneous receipts, United States revenues, in accordance with regulations.

Business operations of the Panama Canal are conducted separately from operating activities pertaining directly to the transiting of vessels, and government of the Canal Zone. The annual appropriation acts for the Panama Canal authorize the use of appropriated funds for the conduct of auxiliary business activities, provided that funds so advanced are recovered through earnings and with the further proviso that any net profit derived from such business activities be covered annually into the United States Treasury.

The total expense of operation and maintenance of silver quarters was $244,383.99 which is approximately $10,500 more than the expenses shown in the table, which have been reduced to equal the revenue collected and the difference has been charged to the appropriation allotment for "Maintenance of laborers' quarters", as shown in table 25, this latter account also being charged with the cost of extraordinary repairs not included in the operating expense of silver quarters.

The marine salvage section is maintained for the protection of shipping in the Canal and adjacent waters in connection with aids to navigation, but this section does not enter into competition with commercial salvage companies, and consequently revenues do not ordinarily equal expenses.

TABLE NO. 27.—*Balances in appropriation and fund accounting ledger June 30, 1933*

Assets	U. S. Treasury appropriations	Cash on hand	Accounts receivable	Transfers available	Storehouse stock	Total
Maintenance and operation	$7,222,103.03	$1,436,938.14	$471,639.95	$52,242.17	$3,885,692.44	$13,068,615.73
Sanitation	56,378.61	105,730.96	107,044.40		70,839.80	339,993.77
Civil government	177,599.58	72,630.90	8,883.97		4,251.24	263,365.69
Total appropriations	7,456,081.22	1,615,300.00	587,568.32	52,242.17	3,960,783.48	13,671,975.19
Miscellaneous receipts		250,752.79	100.00	611,423.74		862,276.53
Trust funds		502,676.31				502,676.31
Total	7,456,081.22	2,368,729.10	587,668.32	663,665.91	3,960,783.48	15,036,928.03

Liabilities	Working capital allotment	Reserve for impounded balances	Accounts payable	Transfers payable	Contingent liabilities	General ledger reserves	Balance	Total
Maintenance and operation	$4,265,000.00	$393,820.08	$1,015,410.73	$611,423.74	$160,870.36	$5,340,722.00	$1,281,368.82	$13,068,615.73
Sanitation	100,000.00	43,728.01	103,545.31	41,936.94	15,097.58		35,685.93	339,993.77
Civil government	10,000.00	47,214.31	97,471.46	10,305.23	1,750.70		96,623.99	263,365.69
Total appropriations	4,375,000.00	484,762.40	1,216,427.50	663,665.91	177,718.64	5,340,722.00	1,413,678.74	13,671,975.19
Miscellaneous receipts			862,276.53					862,276.53
Trust funds			502,676.31					502,676.31
Total	4,375,000.00	484,762.40	2,581,380.34	663,665.91	177,718.64	5,340,722.00	1,413,678.74	15,036,928.03

Fiscal officers, detail	Disbursing	Paymaster	Collector	Total
Maintenance and operation	$70,176.15	$1,249,118.14	$117,643.85	$1,436,938.14
Sanitation	6,677.46	93,122.57	5,930.93	105,730.96
Civil government	973.24	69,736.70	1,920.96	72,630.90
Total appropriations	77,826.85	1,411,977.41	125,495.74	1,615,300.00
Miscellaneous receipts		.01	250,752.78	250,752.79
Trust funds		33,563.08	469,113.23	502,676.31
Total	77,826.85	1,445,540.50	845,361.75	2,368,729.10

The foregoing table shows the status of Panama Canal working capital by the various appropriations and funds by which it is separately accountable, under existing laws and Treasury regulations.

A revolving fund of $4,375,000 is permanently set aside to cover the net investment in current accounts, which sum is included in the capital investment account (table 14). Cash to cover the total amount of funded reserves is also set aside, and the balance indicates the amount available for operation, maintenance, and new construction in addition to the appropriations for the ensuing fiscal year amounting to $9,172,700 for maintenance and operation, $1,235,278 for sanitation, and $698,426 for civil government; also $2,000,000 of Panama Railroad Co. dividends for credit to the appropriation, maintenance, and operation.

The balance of $1,413,678.74 shown in the preceding table covers uncompleted projects to be carried forward to 1934, such as Madden Dam construction.

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